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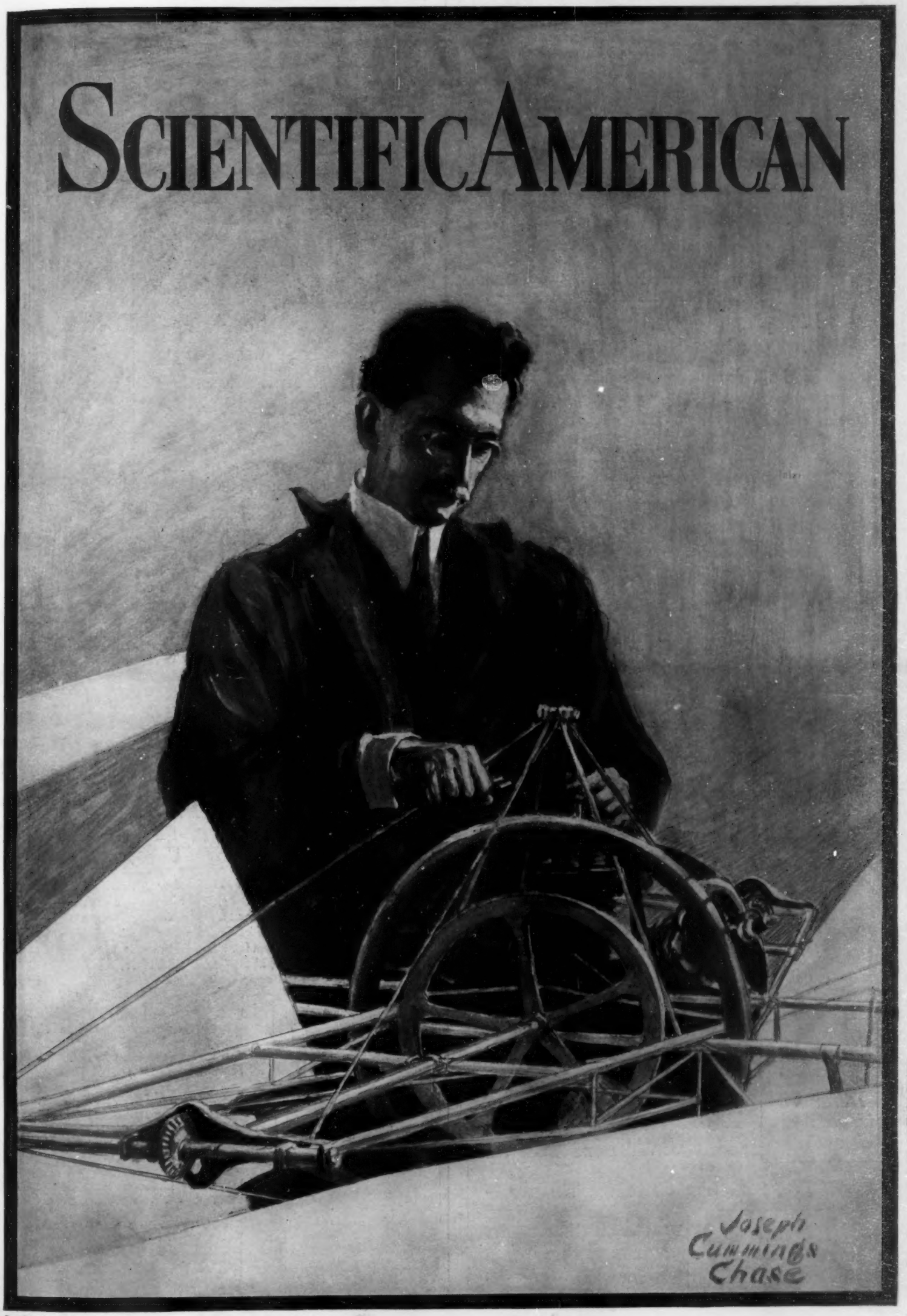

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November 18, 1911

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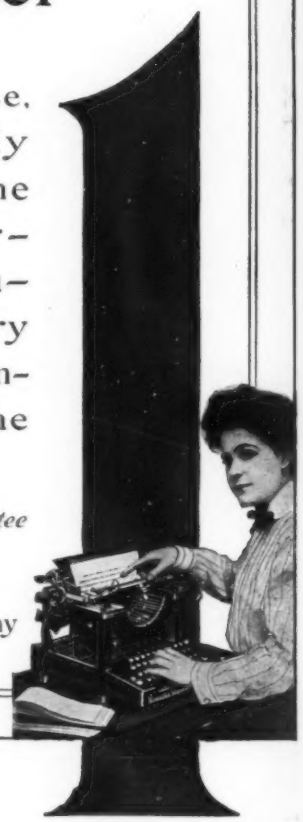

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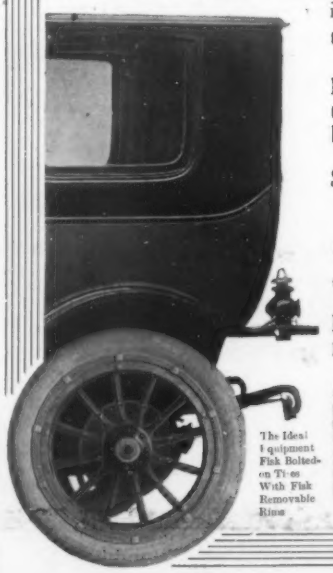

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Thirty-two years ago, when Edison invented the incandescent electric lamp, he saw, in his dream of the future, every home equipped with electric service. He foresaw, thirty-two years ago, that the ideal home of the future would include not only electric lighting, but also electric cooking and heating.

His dream "electric-light-for-everybody" has come true for those who will read and heed. The Edison Mazda lamp with its non-fragile filament, made from a drawn wire stronger than steel, brings electric lighting within everybody's reach. This lamp gives three times the light of the ordinary carbon filament lamp using the same current.

The carbon filament lamp was good; the tungsten lamp was better, but the sturdy Edison Mazda lamp is the last word in lighting because it combines durability with the highest efficiency known.

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The new metal-alloy "Calorite" has been perfected by the General Electric Company. The high temperature necessary for electric cooking causes other metals to oxidize and break down. But here "Calorite" is indestructible.

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SIXTY-SEVENTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

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Looking South from a fork in the road. Canyon City in the distance.

The "Sky-Line Drive"

A Road Along the Crest of a Limestone Ridge

By J. Mayne Baltimore

CANYON CITY, in Colorado, has one of the most remarkable driveways in the world. For certain features there is none other which can be compared with this magnificent drive, so unique is the whole affair.

The "Sky-Line Drive" as it is appropriately named, lies along the very crest of a long and lofty limestone ridge that rises from 800 to 1,000 feet above the surrounding plain on both sides. These limestone ridges are a characteristic feature of the region, and are called "hog-backs." This particular "hog-back" extends west and north of Canyon City, its top forming a long sky-line, and making the horizon in that direction.

Travelers traversing this remarkable "Sky-Line Road" may be seen many miles away—boldly silhouetted against the sky. The remarkably clear atmosphere of the Colorado country renders it possible to secure the smallest details—even glimpses of the sky between the spoke of the wheels, and under the horses. This famous "Sky-Line Drive" affords a most magnificent view. Canyon City lies clear cut, far below the traveler, and one may look down upon it, as if looking on a colossal relief map, and almost as if poised above it in an airship.

The drive is about 35 feet wide, on an average, and it winds to and fro, and sweeps gently up and down on the narrow crest for about four miles. For the greater part of this distance the travelers are more than 900 feet above the city and the surrounding plains, to which, on both sides, the walls of the "hog-back" drop almost perpendicularly.

The beauty of the panoramic view on the other side—beyond Canyon City—is magnificent. Here valley and winding river, foot hills and mountains, have combined to form a marvelous scene filled with loveliness and grandeur.

The drive was constructed by convict labor; that made it possible to carry out such an extensive improvement. All the credit for the construction of the road properly belongs to John Cleghorn, warden of the Colorado State's Prison.

A magnificent view on either hand.

John Cleghorn, ever busy minded and far seeing, conceived the idea of making of this rocky, impenetrable, and dangerous ridge, a driveway. Going to Canyon City, he laid the matter before the more public-spirited citizens of that place. Of course, he had the convicts—"boys" he called them, and the labor would be furnished free to the people; but it took money to pay for the necessary powder, tools, etc., and Mr. Cleghorn could not furnish any money. In less than forty-eight hours the necessary finances were provided, and Cleghorn put large gangs of convict laborers at work immediately. It took a long time to "hew out" the road. Many problems were encountered, but the work was finally completed.

To-day there stands a large monument on the highest point of the road on which are carved the simple words: "John Cleghorn; Sky-Line Drive." This great roadway is a public highway—absolutely free to all—pedestrians, equestrians, and every kind of vehicle, including automobiles. The driveway is one of the leading attractions of Colorado, and its accomplishment besides adding to the grand total of road improvements in the west, serves as a rich example of how means, hardly thought existing, may be used to carry out a large and a successful undertaking.

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

The Navy and the Inventor

IT IS a notorious fact that the inventor who approaches certain of the government departments in the hope that his invention will be investigated without prejudice and, if found meritorious, bought up at a price which will guarantee the inventor in selling his invention with the right to exclusive use, will find that he has a hard road to travel. More often than not he will experience unnecessary delays, to say nothing of considerable financial loss and ultimate disappointment.

An eloquent plea for a more liberal attitude to the inventor is made by that able officer and inventor, Rear Admiral Bradley A. Fiske, U. S. N., in the September issue of the *United States Naval Institute Proceedings*. The argument is so well put that we cannot do better than give it in the Admiral's own words. He points out that it is the duty of the navy to encourage not merely engineering skill and mechanical ingenuity, but real invention. "Knowing the brilliant original inventive genius of our countrymen, we must not stop short of a determined effort to 'ascend the highest heaven of invention.' We must hold as high an ideal in this matter as we do in the matters of strategy, tactics and engineering.

"Such a policy, wisely and energetically carried out, will have as direct and beneficial effect on the navy as our admirable patent system has on the country at large. But, to carry it out, we must first treat inventors as sane and reputable men, and recognize the fact that not only does an attempt to evade plain patent rights seem to inventors dishonorable, but it turns them to fields where they have more chance than in a battle against the government.

"Why inventors should be treated as they have been is not quite clear. Certainly it has been neither wise nor right to humiliate a class of men who have been useful in the past, and can be made useful in the future. Certainly it is not right for a great government to violate its own patent laws, and infringe patents which the government itself granted and for which it received $35 each.

"Does anyone deny that our electric lights, torpedoes, guns and engines were invented before they were developed; that they were conceived before they grew and waxed into maturity? Does anyone deny that, but for inventors, the coal and iron and brass of our ships would still be in the bowels of the earth? We all know that ideas are what have breathed the breath of life into material brass and iron. *It has already been possible for one invention to increase the hitting power of naval guns at least ten times.* Why not develop such things as soon as possible in secret, and secure the military advantages accruing: instead of resisting them until all the world knows about them, and then being tremendously secret about details that any intelligent mechanic can vary in a dozen ways?"

Patent Property. What It Is. Its Protection

A UNITED STATES patent in terms purports to grant to the patentee "the exclusive right to make, use and vend" the invention therein set forth during the term expressed in the grant throughout the United States and its territorial possessions.

The wording of this grant is misleading, for the government cannot grant to anyone, any right, exclusive or otherwise, to make, to use, or to sell an invention which in any way trespasses upon the prior rights of others. A patent is only *prima facie* evidence of the right to exclude others from making, using or vending the invention, and it is always open to the infringer to show that the patent is invalid, by reason of the absence of novelty, utility or invention in the patented device, or because of other statutory defenses.

Many patentees seem to have the impression that the government should of its own initiative compel the alleged infringer to cease his infringing acts. But because the patent is only *prima facie* valid, the government cannot act until proof is offered showing its validity, and for the same reason the infringer refuses to stop his infringing acts.

Having once, however, proven to the satisfaction of the courts of the government, that the patent is good and valid, protection will be at once afforded to preserve the rights of exclusion bestowed upon the patentee by its grant. This result, however, is attained in the great majority of patent suits only after the expenditure of considerable money, and the expiration of months and sometimes years of time. The owner of a patent, believing his rights to be infringed, if he decides to proceed against the infringer, files a bill in equity, the great majority of patent suits being brought on the equity side of the court. In this bill, he charges the alleged infringer with the infringement of his patent. The infringer thereupon becomes a defendant, and either denies that he has committed any act of infringement, or admitting that he has, he justifies his acts by pleading that the patent is invalid, and oftentimes combines in one answer both of these offenses.

It is not often that an infringer is discovered making the thing identically as shown, described and claimed in the patent, and the question whether the thing which he does make, constitutes an infringement, thereupon becomes an issue. Occasionally, it will be found that the infringing device is identical with that of the patent, and in such cases, the validity of the patent will constitute the issue. In this attack upon the validity of the patent, it may be shown that the invention was not new at the date of the patent, that it was not the invention of the patentee, or that it had been in public use and on sale more than two years prior to the date of the application on which the patent was issued.

The preparation of and presentation to the court of the evidence on behalf of the patentee, and the alleged infringer, is what involves the extraordinary expense incident to patent suits. The decision in such cases generally rests upon the testimony of experts. Those who testify for the patentee, explain to the court the construction, organization and mode of operation of the invention of the patent, and comparing the same with the thing or things made by the alleged infringer, and express their opinion as to whether or not such things embody the patented invention. The experts for the alleged infringer thereupon place their interpretation upon the patent at issue, and upon such other and prior patents, both domestic and foreign, which may be relied upon as showing either that the patent in suit is of restricted scope, and not infringed by the defendant's manufacture, or is completely lacking in novelty and invention. This evidence is taken before an examiner, and the cost in the average case approximates $175 per day. A further expense arises from the necessity of printing the evidence for presentation to the court. This entails an expense of from $1 to $1.25 per printed page. The expense may be greatly increased by the introduction of irrelevant and immaterial testimony, and also the placing upon the record of extended and oftentimes unwarranted objections of counsel, all of which must be taken down by the examiner and presented to the court, for under the present rules he cannot pass upon the admissibility of evidence.

It has been stated that the cost of taking the testimony and presenting it to the court in the famous Selden case, was upward of $150,000. In that case, after long years of litigation, while the patent was not invalidated, the defendants ultimately escaped the charge of infringement. Fortunately for the owners of that patent, however, it was *prima facie* of such a formidable character, that long before the final adjudication, they had succeeded in collecting from the manufacturers of automobiles, thousands of dollars as royalties. The brief in the Selden case consisted of two large octavo volumes of at least 500 pages each, and could have been produced only at considerable cost.

Another famous case wherein the city of New York was sued, for infringing a patent covering an automatic relief valve for fire engines, was fought through the courts for a period of twenty years before final adjudication, at an estimated cost of half a million dollars, and was finally decided in favor of the city on the ground that the patent was invalid, the invention having been proven to have been in public use two years and eleven days before the patent was applied for.

The right of exclusion, however, which the government bestows upon a patentee, and which costs so much to enforce, has proven in many cases to be an extremely valuable right; has enriched many inventors, and constitutes the foundation of vast business enterprises, and to this right, largely, is due the wonderful progress of the civilized world.

Build a New Patent Office

THIS is not the age of sentiment or conservatism. A costly new building twenty stories high, for example, must be demolished to make room for one forty stories high which will yield a correspondingly higher profit.

The SCIENTIFIC AMERICAN has repeatedly called attention to the urgent necessity for a newer and greater Patent Office. An article was recently printed giving the facts about the over-crowded and obsolete building now occupied by the Commissioner of Patents and his force of one thousand subordinates. This article was prepared for the purpose of showing the inventors of the country and the manufacturers and merchants that they have been woefully negligent in not insisting that Congress take some steps to house the Patent Office decently. Their negligence, however, has been nothing to that of Congress itself, for the inventors, manufacturers and merchants cannot acquaint themselves at first hand with the conditions at Washington without considerable loss of time and money, while Congress, on the other hand, has been repeatedly and persistently importuned in the matter, and every member of Congress is in a position to thoroughly satisfy himself on the subject.

Ever since Commissioner Moore first took the office he now holds he has been reminding Congress that the Patent Office is in need of legislative action to give it larger and better working quarters. Bills have been introduced carrying the necessary appropriations and arguments have been made in the committees, all to no avail.

The surprising thing about this dilatory policy on the part of Congress is the fact that the Patent Office, which is one of the very few self-supporting branches of the government, has a sufficient surplus in the Treasury to defray all the expenses of a new Patent Office building, including the ground to build it on. This surplus, which amounts to something like seven millions of dollars, represents a net profit over all the expenses of running the Patent Office since it was first instituted. A pretty comfortable margin of profit, indeed, when one considers the enormous expenses that the office is under to get competent examiners and to turn out high-grade printing, photolithographing, etc. What private enterprise whose net profits were seven millions of dollars would be content to occupy a building wholly inadequate for its needs?

Congress has no right to require clerks to work in dark, crowded rooms, where health is endangered and ambition thwarted. Disagreeable surroundings have a physical and mental effect on workers. Ask any housewife whether she can work or live happily in an untidy house. In such a household one would look for disease, sloth and uncleanliness. Is it not equally discouraging for men and women to work in a room where documents and books are piled high, accumulating dust, and in a semi-chaotic condition, just because there is no room for them to be properly cared for?

Congress does not have to appropriate a single dollar for the building of a new Patent Office over and above the surplus already earned by that bureau. A bill should be passed early in the coming session giving relief to the Patent Office. Every session that sees nothing done in this regard increases the gravity of the situation. The Patent Office records are of the utmost value. Their loss or destruction would undermine the foundations of the entire business world. They could never be replaced. The security of countless millions of dollars rests in their preservation. The Patent Office models, too, lead a precarious existence, and some effort should be made to give them proper storage facilities until such a time as they can be properly housed in the new Patent Office.

Some day when it is too late, perhaps Congress will be forced by the clamor of public opinion to allow the use of the Patent Office's money for a new building. Why not take action now, while there is yet time to save these priceless records?

Edison's Impressions of European Industries

[That the powers of observation and analysis, which have contributed so largely to Mr. Edison's success, were used to good effect during his recent lengthy tour of Europe, is evident from the following "impressions" which were given, during a recent interview, to a representative of the SCIENTIFIC AMERICAN.—ED.*]*

Q. WHAT feature of the industrial situation in Europe has made the deepest impression on your mind, Mr. Edison? Ans. I am free to say that among the countries which I traversed, Germany has left by far the deepest impression on my mind, particularly as regards the enormous strides which she is making in the development of her industries and the extension of her foreign trade.

Q. What do you consider to be the fundamental secrets of Germany's success? Ans. Her intelligence, her patience, her industry, and her appreciation of the value of co-operation. In the development of their industries and commerce, the Germans are a united people. They are working upon a carefully co-ordinated plan, having for its ultimate object the capturing of the major portion of the world's commerce; and in this effort they have the great advantage over other countries, and particularly over the United States, that they have back of them the assistance and prestige of the German Government.

Q. What is the German attitude toward the inventor? Ans. I find that the inventor has better opportunities in Germany than he has in the United States, and this for the reason that any factory which manufactures articles of the character covered by his invention is encouraged to take hold of it, because of the financial assistance which it can secure from the great promoting banks, of which the Deutsche Bank, one of the largest in the world, is the most notable example. If an inventor brings a new invention to a factory, he is not likely to be turned down because the company is without the necessary capital to cover the cost of its manufacture and exploitation. They can present the invention for the consideration of a corps of engineers and auditors, which is maintained for that special purpose by the Deutsche Bank, and if they pass favorably upon the invention and upon the standing of the manufacturing company, the company will be financed to such an extent as the bank may think proper. Now we have no such promoting banks in this country. The inventor must either endeavor to interest the manufacturer by personal application, or he has to fall back upon the professional promoter, who too often is quite unreliable.

Q. To what extent does the German Government stand back of the patents which it grants? Ans. Although the German Government does not guarantee the validity of the patent, it practically arrives at the same result by making it a very difficult matter to obtain a patent. In the first place, the invention must be quite meritorious. The inventor will have a long fight in the Patent Office, in which the question of its priority will be most carefully investigated. But when he once obtains his patent, it is a patent, and after a certain number of years it cannot be disputed. The German patent possesses the greatest value, and if an American inventor has a really meritorious invention, I would advise him to fight the German Patent Office to the very last ditch. If his invention possesses distinct merit he will be treated fairly and will get his patent. Before leaving the subject of patents, I may say that I do not think the corporations follow the practice of buying up patents simply to pigeon-hole them, and I do not believe that this is done in the United States as much as some people imagine.

Q. Have they a "trust" problem in Germany? Ans. Regarding German business methods, particularly among the corporations, I find that though they do not have "trusts," as we understand the term, in Germany, they have what is practically the same thing. They have pools or cartels, which set the price that all the people, or a portion of the people, as the case may be, engaged in any industry, shall ask for their goods. They have a central agency; but over this the Government exercises no supervision, and indeed, it does not prevent the formation of these pools, realizing that destructive competition will never build up German trade. Take note, however, that these cartels do not strangle the small man. They take him in, or, if not, do not close the door of equal opportunity.

Q. To what extent is American machinery used in Germany? Ans. Every American manufacturer who visits Germany will be at once impressed with the widespread and increasing use which is being made by the Germans of American machinery—machinery either of American make or American design. When they take American designs as their models, they make very little, if any, improvement therein. Their labor costs very much less than ours, and therefore there is not the same incentive to design automatic machinery, and, very wisely, they leave this particular field to the Americans. When we have improved our machinery, they come over and buy it, and after they have tried it out and found it to be satisfactory, they duplicate it. It would be foolish for the Germans to go ahead and try a lot of experiments in making automatic machinery, when they know that the Americans are bound to do it anyway, and do it better than they can. Undoubtedly, Germany has benefited enormously from the introduction of American tools and American methods, but the debt is not altogether on their side. Germany is a great scientific nation, continually engaged in scientific research; and as the result of this, we not only get from her a large number of scientific discoveries which we apply to our industries, but she also furnishes us with an enormous amount of chemicals for use in our various industries. The German, on account of his patience and other valuable peculiarities, is well equipped for the task of working out tedious and involved processes—something which the average American takes to very unkindly. The American wants quick results. He is forever striving to cut down the time element, and hence, as I have already stated, he is pre-eminent in the field of automatic machinery. But for the task of developing intricate processes, involving much time and extraordinary patience—processes which, as in chemistry, involve many unknown reactions—the German is wonderfully well qualified.

Q. Does German superiority extend beyond the chemical industries? Ans. It must not be thought that German advance is restricted to the field of the chemical industries. Not only is she already pre-eminent here, but she is threatening our supremacy in many other branches of manufacture. The danger for us lies largely in the raw methods of interference by the Government and the weighting down of business with cumbersome and little-understood laws, some of which are enforced and others not. Furthermore, while political interests in Germany are universally friendly to trade and commerce, in this country politics is one of the heavest burdens that industry and commerce have to carry. Here in America we have no mercantile marine to carry our goods; and, even if we had, we possess no banking facilities in outside countries to assist the exporter in selling the goods. We have no corps of young men specially educated to go out to foreign countries and hustle for business. A large and rapidly-increasing part of the products which I saw in course of manufacture and being shipped from German factories was not for use in Germany, but in countries outside of its borders. Unless business in the United States is put on a more satisfactory basis, and is rid of the present interference by the politician, Germany will be in such a strong relative position that she will win out against us right down the line.

Q. Do you think the German dream of commercial supremacy will be realized in the near future? Ans. Personally, I do not believe that Germany will attain pre-eminence in the commerce of the world as rapidly as some people think. To-day, Great Britain is the leading nation in manufacture, engineering, and shipping, with all that this implies. She has an enormous, well co-ordinated and harmonious empire, and at present she has the great advantage that she holds the leading position in finance. Germany does not hesitate to let the world know that she aims at the high position now being held by the English people as the leading commercial nation, and in the race for supremacy she is going, just now, very much faster than any other country. She is giving England a great run, and, judging from present conditions in the two countries, it looks as though in time she should reach the goal—but not just yet.

Q. Do you see any signs of decadence in Great Britain? Ans. I do not think that the English nation is decadent. Far from it. But I do consider that there are conditions in the English industries which, unless they can be changed, must lead to commercial decadence. I refer to the very serious question of her union troubles. In Germany I saw a man working three planers; I understand that in England the unions will not permit such a thing to be done. All through the German shops, any man will work as many tools as possible. All the factory operatives are on piece work. This, I believe, is not permitted in England. Hence the Germans can manufacture goods of the same quality as the English very much more cheaply; export them in their own ships; and finance the sale of them over a long period—and I can see but one ending to a competition of this character. Furthermore, the English business man does not come as early to his work, and he leaves it earlier than does the German.

Q. This great increase in the German navy—does it mean war? Ans. I do not believe that this commercial rivalry between the two nations will lead to war. Emperor William is a pretty good business man, and he would be very foolish, now that German commerce is spreading so rapidly over the world and German ships are found upon every trade route, not to take the proper measures to insure these enormously valuable and growing interests. The best insurance for a large foreign trade is a navy adequate to its defence. I do not think that the Emperor and his people are building the big German navy with any express intention of fighting England or any other nation. Germany in building her navy, has simply given notice to the world that she is a big manufacturing nation and that she is going to find a market for her goods in every corner of the earth. Therefore, she is going to see to it that no more countries shall be shut up against her commerce. This, of course, is making Germany unpopular; but I cannot see that her attitude is anything but perfectly reasonable and proper.

Q. While in Germany did you look into the matter of municipal government? Ans. I wish to pay tribute to the high state of perfection to which they have carried their system of municipal government. In the first place, they appoint a very high-class man for mayor, and he holds this distinguished and greatly honored position for life, or until such time as he is retired. One direct result is that these mayors are all the time trying to better the government of their cities, to bring in new industries, and to improve them artistically and otherwise. I had the pleasure of meeting six or eight of the mayors of different German cities. They were certainly the very finest type of men. Most of them spoke English without any accent whatever, which greatly surprised me. Furthermore, their knowledge of engineering was of quite a high character. I could not learn that there was any graft whatever in any of these German cities.

I have spoken of the artistic improvement of the German cities. The same spirit is observable in France, and generally in such European cities as I visited. Ugly or unsightly buildings or freak buildings of any character whatsoever are not allowed to go up. They carry this principle to such an extent that in Paris where they have a great many double-deck 'buses run by gasolene, an order was recently promulgated that after a certain date no more double-deck 'buses must be used in Paris, for the reason that they were inartistic in appearance. It was understood, of course, that the double-deck 'buses were more profitable; but Paris would not permit the corporation to earn its greater dividends at the expense of the general artistic appearance of the streets, although the city, I understand, is a partner in the enterprise.

Q. Naturally the lighting of European cities interested you, Mr. Edison. What did you observe? Ans. Speaking of the conditions in the cities, I noted that the lighting of the leading European cities does not compare with that of New York. Berlin and Paris are about equally well lighted; but Berlin is continually putting in more light, and before long she will greatly surpass Paris in this regard. Night life in Berlin is increasing very rapidly. It was observable that throughout Europe the night life is on the increase in those cities which have cheap water power, and there seems to be a correlation between the night life and the industrial activity of the people. In towns where the people have cheap and plentiful light, they keep later hours, and this seems to have the effect of mitigating the phlegmatic character of their temperament. In Switzerland, for instance, I have seen two towns which were of the same size and generally alike in their conditions, with the exception that one, possessing suitable water power, was well lighted at night, and the people of this town instead of going to bed at eight o'clock, were on the streets up to ten, or even later. This town had decidedly a smarter appearance. More buildings were going up, and there was a general air of enterprise. Many people sleep too long, and over-sleeping, contrary to commonly accepted ideas, so far from being refreshing, renders one sluggish and slothful. Hard work, work in which you are thoroughly interested, is more stimulating and refreshing than sleep for sleep's sake.

For thirty years I slept only four hours a day, and I have had lots of assistants at various times that did the same thing. We all felt fine.

Needed Reforms in Patent Procedure

By Melville Church

WHILE our patent system has commanded the admiration of the world and has had many imitators, it is certainly susceptible of much improvement, as any one familiar with the details of its workings will testify.

The delays and expense involved in securing a patent, against the opposition of an adverse claimant, the enormous cost and delay involved in attempting to enforce a patent when granted, and the lack of conclusiveness of the judgment finally secured, save in the particular jurisdiction in which it is rendered, call loudly for reforms in procedure.

Under the law, as it now stands, if an applicant for a patent encounters in the Patent Office a rival claimant to the same invention, a proceeding is instituted, known as an interference, for the purpose of determining the question of priority of invention as between the two claimants.

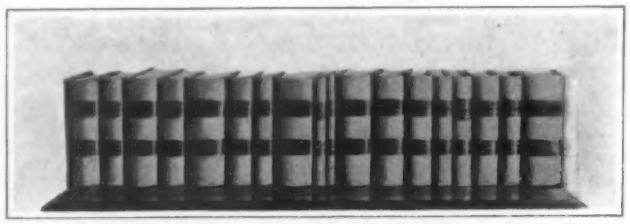
Opportunity is given each claimant to adduce evidence in support of his claim and, when the evidence is all in, the case is first argued and submitted to an officer, known as the Examiner of Interferences, for determination. The Examiner of Interferences reads the record of testimony (which, by the way, is apt to contain much irrelevant and immaterial matter because of the uncontrolled way in which it is permitted to be taken) and, after from two to four months' delay, renders a decision awarding priority to one or the other of the parties, and fixes a limit of appeal from his decision. Within such limit, which is never less than twenty days, the unsuccessful party may appeal to the Board of Examiners-in-Chief, a tribunal of three judges. This Board sets a day of hearing one or two months distant, and, on that day, there is another argument and submission.

After a period of from two to six months, the Board renders its decision and sets a limit of appeal of not less than twenty days. The party unsuccessful on the last appeal may then appeal to the Commissioner of Patents, in person. If he does so, a day of hearing will be fixed from one to two months distant, when there will be another argument and submission. Within a period varying from one to four months, the Commissioner will hand down his decision and the party aggrieved thereby may, within forty days of the entry of the judgment, give notice of appeal to the Court of Appeals of the District of Columbia, and, within forty days after said notice, may docket his appeal in such Court of Appeals. The last named court is a tribunal of three judges, sitting in Washington, and bearing the same relation to the Supreme Court of the District of Columbia and to the Patent Office that the United States Circuit Court of Appeals for any one of the nine judicial circuits bears to the Circuit Courts of that circuit.

If the appeal to this Court of Appeals is, for instance, docketed in May, it cannot be heard for six months, or till the November term following. When the court hears the appeal taken to it and hands down its decision, it might be thought that the controversy would be settled; but this is not the case. The decision of the Court of Appeals is not final as to any question litigated before it and the unsuccessful party has still the right, under the provisions of Section 4915 of the Revised Statutes, to file a bill in equity against his so-far successful rival, in the judicial district in which the latter may be found, asserting anew his claims to priority. In this bill-in-equity proceeding the plaintiff is entitled to make an entirely new record of testimony and may again call all the witnesses he called in the Patent Office proceeding and as many more as he can find, with, of course, the privilege of the defendant to do the like. It will take the better part of a year to get this equity case ready for hearing and, after it is heard, the Circuit Court will probably hold it from two to six months before deciding it. The defeated party may then appeal, as a matter of right, to the United States Circuit Court of Appeals for that particular judicial circuit, at any time within six months of the entry of the decree in the Circuit Court.

After the docketing of this last appeal it may take six months more before the appeal is heard and several months more may elapse before the appellate court hands down its decision finally setting the question of priority at rest.

It will be seen from the foregoing recital that a priority contest may involve the taking of testimony in the initial Patent Office interference proceeding; a first hearing and judgment by a tribunal consisting of one person; a review of that judgment by a tribunal of three; a further review by a tribunal of one; and a still further review by a court tribunal of three; all upon the same record, followed by a further review, on an enlarged or an entirely new record, by another trial court and a final review by another appellate court.



The enormous record of the Selden case.

"The evidence on the subject of operativeness is the most flagrant example of unsupervised testifying I have ever seen or heard of. Whether in 1905 Exhibit 47 was any better than scrap, whether Exhibit 89 would start on flame ignition, whether Exhibit 132 showed diagrams revealing volume or pressure constant, were perhaps interesting, but unimportant questions. They raised a false issue, over which months of time and volumes of print have been expended." (Judge Hough, in the Selden case.)

Even if the judgment of all the tribunals to which the controversy is submitted be in favor of the same applicant, still, before the final judgment is arrived at, he must submit to being dragged through this long and devious course of litigation, at ruinous expense, before his right of priority can be said to be firmly established.

There is absolutely no necessity for such protracted litigation. The inordinate number of appeals permitted serves no useful purpose whatever. The submission of the controversy to a single tribunal of first instance in the Patent Office, with the allowance of one appeal to an appellate tribunal outside of the Patent Office—the Court of Appeals of the District of Columbia, for instance—with power in that court to make a judgment that shall be final and conclusive, as between the parties and those claiming under them, as to every matter involved in the litigation, would seem to be a complete and satisfactory solution of the problem and tend to the furtherance of the cause of justice.

There is no more reason for providing a long series of tribunals to try out an applicant's right to priority of invention over a rival claimant than there is for determining, in the same way, any other matter of private right.

A claimant to a piece of land containing a gold mine brings his action of ejectment in a Circuit Court of the United States (the requisite diversity of citizenship existing) against the person in possession, and, if judgment goes against him, he may, by writ of error, remove the case to the United States Circuit Court of Appeals for that circuit, and if the judgment below is there affirmed, the litigation ends.

But, under existing law, an applicant for a patent may contest with another a claim to priority of invention not through two only, but through six different tribunals.

The right to invoke the aid of so many tribunals works a hardship upon both the inventor and upon the public. Experience has shown that the final judgment reached after submission of a case to two tribunals is as liable to be correct as that reached after submission of the same case to six different tribunals.

An inventor enamored of the value and importance of his invention will, of course, pursue his claim through as many tribunals as the law provides, or until his money gives out, but it is no real kindness to him to afford so many additional outlets for his enthusiasm. On the other hand, it would seem to be contrary to public policy that the judicial machinery of the government should be susceptible of being put into motion so many times for the protection of this particular kind of private right.

The first great reform our patent system needs is, therefore, the cutting down of the number of appeals in priority cases.

But the trials of an inventor by no means end when, after undergoing the delay and expense consequent upon the vast number of appeals provided, he at last secures his patent. If his ancient adversary, who has contested his right while he was getting a patent, shall continue to practise the patented invention, he must, under the present state of the law, bring a new suit against him for the purpose of stopping him. This usually takes the form of a suit on the equity side of a Circuit Court of the United States, in which he asks for an injunction and an accounting of profits and damages. In such a suit, the defendant may challenge the novelty and utility of the patented invention, the identity of his appliance with that covered by the patent—though it may be the same appliance that was involved in the prior interference proceeding—and about the only thing he may not do is to again assert his claims to priority of invention.

When this suit in equity is, by the pleadings, brought to an issue, time is given for the taking of testimony by the plaintiff and defendant, respectively. The witnesses examined are not produced in open court before the judge, so that the latter may observe their demeanor while testifying, and pass upon the competency, relevancy or materiality of the testimony offered, and generally control the proceedings, but, as in the Patent Office proceeding, the testimony is introduced in the form of depositions taken before notaries public, or standing or special examiners of the court, who have no power whatever to pass upon the competency, relevancy or materiality of the evidence offered, or otherwise to control the proceedings, but who simply act as recording officers, taking down everything that is offered by way of testimony, as well as the objections and arguments and irrelevant remarks of counsel, and returning all to the court for the latter's examination. Because of this lack of restraint in the production of evidence, the depositions are extended and long drawn out, some of them, especially the depositions of experts, continuing for weeks and even months, until the record, as one of the federal judges has said, looks as though it were afflicted with elephantiasis.

When it is remembered that good patent lawyers charge from twenty-five to one hundred dollars a day for their services and that good experts charge fifty

(Continued on page 464.)

Campbell vs. the Mayor, etc., of the City of New York.

This suit on the Knibbs patent for a fire engine relief valve was filed originally in 1877. The patent was sustained in the lower court and a master's hearing ordered. This photograph relates to the master's hearing. On the extreme right sits Judge Joseph M. Duel, now Judge of General Sessions Court, New York, the master appointed by the court. Next is Samuel R. Betts, counsel for the defendant, Harvey Hadlock and Mr. Wood (both now dead) of counsel for complainant, Mr. Washburn, executor of the estate of the complainant. The books forming the background are the entire records of the New York Fire Department at that time, secured by *subpœna duces tecum*, and stacked up to form background. The legal proceedings continued over a period of twenty years.

The French Competition for Military Aeroplanes

Some of the Leading Machines and Tests They Successfully Fulfilled

ALTHOUGH the United States was the first government to purchase an aeroplane for military use, the much more rapid development of the heavier-than-air machine in France led to a quick appreciation of its possibilities for scouting above both land and sea, and the government promptly offered generous prizes this year for the fastest military aeroplane which should fulfill certain conditions. These were that the aeroplanes should transport a total useful load of 660 pounds (made up of 3 men, supplies, etc.) at the rate of at least 37¼ miles an hour without a stop throughout a distance of 186 miles. Only machines which were not eliminated in the strenuous preliminary tests were eligible to compete in the final race. To the constructor of the winning machine was to be awarded a prize of $20,000 and an order for ten similar machines at a price of $8,000 each.

The preliminary tests consisted of about a half-dozen flights from the aerodrome at Rheims to certain specified points where the machines were obliged to land upon meadows, stubble and plowed fields, and to start therefrom again, each time carrying a full load of 660 pounds. There was also a "climbing" test in which they were compelled to ascend to a height of 500 meters (1,640 feet) in 10 minutes, while carrying a full load.

In addition to the successful carrying out of these various tests, the following hints were given as to what was desirable:

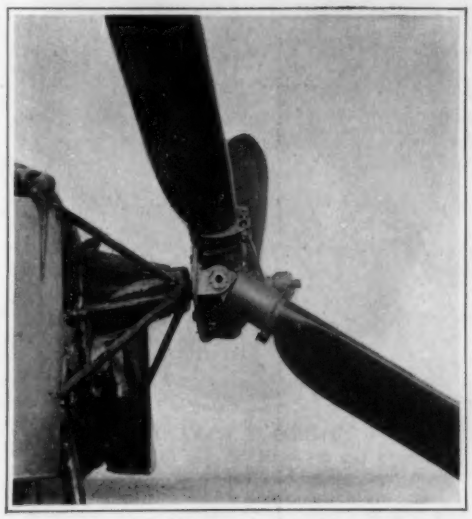
That the observer's field of vision should not be interfered with by any part of the machine.

That double control should be fitted, or, at least that the pilot should be capable of being relieved by his assistant while in flight.

That machines should be capable of starting without outside assistance.

This competition has undoubtedly had a decided effect in stimulating invention and the perfecting of machines. For example, two triplanes made their debut in it, whereas both the Farman brothers brought out biplanes with offset upper planes—a system originated in France by Goupy about a year ago, and which has also been used by Mathew B. Sellers in this country with his multiple-surface, low-powered fliers. The planes have a better lifting effect when they are offset in this way. Henry Farman also entered a biplane the upper surface of which extended beyond the lower one at each end, having a spread of 67 feet.

Instead of obtaining the increased lift necessary by increasing the surface or offsetting the planes, most of the monoplanes effected this by increased power, although the wings were generally somewhat larger than usual. The Nieuport monoplane is shown in one of our illustrations, while another gives a rear view of the novel "armored" Antoinette. This machine was described fully in our last issue. It is the first monoplane constructed and flown successfully with rigid wings without guys, a construction indicated by us in the SCIENTIFIC AMERICAN of October 22nd, 1910. The Nieuport monoplane is noteworthy as being the fastest aeroplane in the world. Its wide blunt body, completely covered with cloth, slips through the air with a minimum of resistance. The machine is shown fitted with a four-bladed propeller, which seemed to be the vogue in this contest. Another aeroplane to use this type of propeller, which long ago was shown in Maxim's experiments to be not so efficient as a two-bladed one having the same blade area, was the Breguet biplane. The body portion of one of these novel machines is shown being towed behind an automobile. They are far simpler in construction than any other biplane, and can be quickly put together or taken apart. Complete details of the chassis will be found in SUPPLEMENT No. 1873. A photograph showing a Breguet biplane being asembled was published in SUPPLEMENT No. 1867. One of the latest inventions of M. Louis Breguet is the propeller with pivoted blades shown herewith. The advantage of this mounting lies in the fact that the propeller blades can adjust themselves to vary the pitch. When starting, the normal pitch is too flat, but by having the blades hinged they will swing forward automatically in proportion to the resistance offered by the air, thereby altering the pitch and thus accommodating themselves to the varying requirements.



The Breguet triple-bladed flexible propeller.

One blade is shown pulled forward. This flexibilty prevents breakage of the blades, in turning, owing to gyroscopic force.

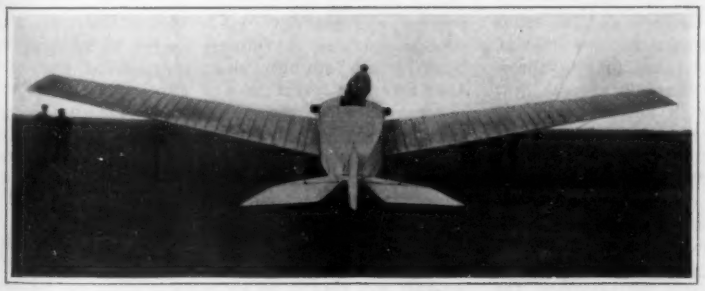
Thirty-three machines were entered in the contest altogether, but some of these failed to materialize, so that there were actually but 28. Of these (9 monoplanes and 19 biplanes) 3 monoplanes and 5 biplanes were selected for the final speed test on November 4th. The results of this test are not available at the present writing, but it is probable that the prize went to the Nieuport monoplane piloted by the American Weymann. This machine surprised everybody by the success with which it landed and restarted from plowed fields and rough ground. Its central skid and flat leaf spring connecting the two wheels worked exceedingly well under these trying conditions.

There were three fatal accidents incidental to the carrying out of these tests. One occurred on the ground, a mechanic being struck by a rapidly revolving propeller and sustaining injuries from which he died. Lieut. Conneau, the winner of all the big circuit races last summer, also had a bad fall in his Blériot and broke his legs. René Level fell in his Savary biplane and was killed as a result of engine failure. He struck some wires in a forced descent of 500 feet and his spine was broken in two places. Jean Desparmet, pilot of a 140-horse-power Blériot monoplane, was the third man to lose his life, and the thirteenth military aviator whom France has lost. He was flying splendidly in perfect weather, when his monoplane suddenly dived to the ground from a considerable height.

When we consider that France has over 200 military aeroplanes, and that numerous flights are made daily by her military men, the number of fatal accidents is not so great as might be expected. The military aviators take great risks to demonstrate the practicability of the aeroplane in all kinds of weather, and many of these, for their daring and courage, have received the Cross of the Legion of Honor.

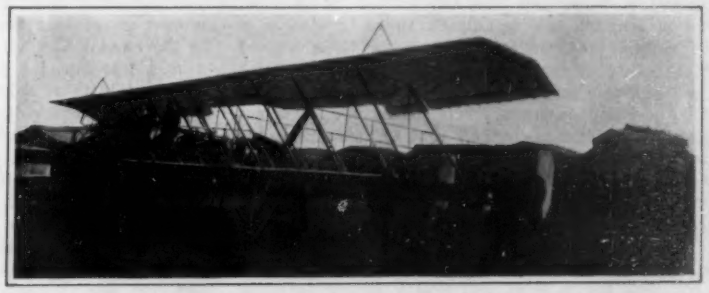
Side view of Nieuport monoplane equipped with four-bladed propeller.

Body of a Breguet biplane towed behind an automobile.



Rear view of "armored" Antoinette monoplane.

This machine is noteworthy on account of the complete lack of guys above and below the wings.



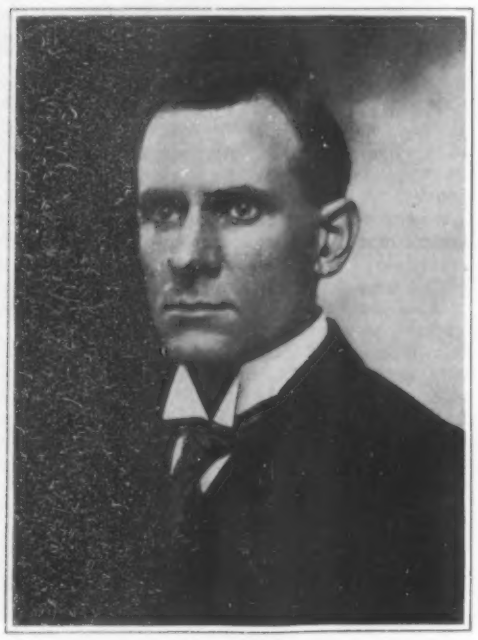
Three-quarter front view of new Farman military biplane.

Note the offset planes and the inclined fuselage projecting out in front. Behind M. Henry Farman there are two seats in tandem for passengers.

Front of latest Blériot military monoplane.

Note the "Normale" propeller and triple wheels as well as the isinglass window in the side of the body.

THE FRENCH COMPETITION FOR MILITARY AEROPLANES



CHARLES F. SCOTT
Discovered the phase-transformer.

JAMES W. GAYLEY
Developed the dry-blast process for steel furnaces.

PAUL M. LINCOLN
Invented a synchronizer.

The Industrial Corporation and the Inventor

EVERYONE who has been intimately connected with any large manufacturing companies, especially those manufacturing machines such as lathes, planers and other tools, will recall the activities of certain *attachés* of the companies who were recognized as employed for the specific purpose of suggesting and devising improvements in the machines. These inventors spent many hours daily in the shops seeking here and there the improvements which might place the machines produced by the company in a better position for competition with those of other makers. Many of the large industrial corporations of the country have intimate connection with groups of inventors especially skilled in certain directions.

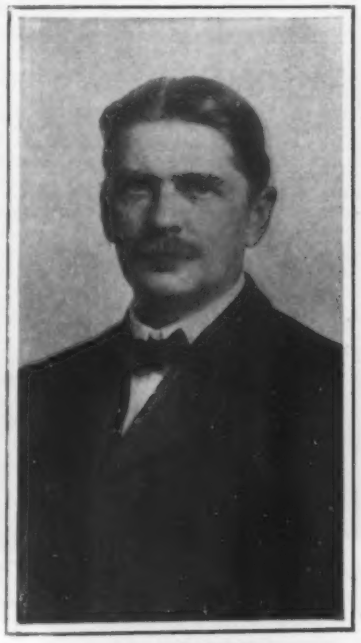
From the foregoing it is readily appreciated that the problems presented to many of our industrial organizations necessitate the employment by them of men of scientific and technical training, graduates of our colleges and technical schools, or those trained in the school of experience, who being presented with a problem and having knowledge and originality, can, if the occasion demands, create inventions. It is not surprising, therefore, to find that to these men, the identity of whose inventions is often lost in that of the organizations of which they are a part, we owe many of the improvements which mark our industrial progress.

The employment of technically trained men by the large companies will be found extending throughout many arts, but it is natural that it should be found especially emphasized in the electrical and metallurgical developments to which much of what follows will be confined, serving to illustrate the importance, in fact the practical necessity, of the inventor as an adjunct to large industrial corporations. While it is impossible within the limits of this article to enumerate all such that are worthy of mention, a few illustrative cases will serve to indicate how greatly we are indebted to these men for the advances made in the arts.

The metallurgical art furnishes many interesting examples of difficult problems met and solved by men of genius in the line of their employment. To illustrate, it would perhaps scarcely occur to one not confronted by the fact in actual working, that the variable quantity of moisture in the atmosphere might produce a deleterious effect in the operation of blast furnaces and steel converters which, as is well known, consume large quantities of air, the former in the process of reducing the oxides of iron, and the latter in the oxidation of certain impurities. Nevertheless, it is a fact that the presence of moisture in appreciable quantity is injurious because it absorbs heat due to its decomposition at high temperatures, and moreover, the variations in the quantity of moisture produce corresponding irregularities in the quality of the product. It is estimated that between sixty and two hundred and forty gallons of water per hour may be delivered to a blast furnace in this manner. The effect can readily be appreciated. Since the air must be supplied under pressure and in enormous quantities, the use of chemical agents for removing the moisture does not offer a ready solution of the problem. The difficulty was effectually solved, however, by James Gayley, who devised a system wherein the air, under pressure, in its passage between the blast engine and furnace or converter, was cooled in successive stages by contact with a series of pipes arranged to conduct a refrigerating fluid across the direction of the air current. The air before being fed to the furnace or converter was, in this way, cooled to a temperature at or below zero degree Centigrade, which caused the precipitation of the greater portion of its moisture. The water of condensation was then drawn off through pipes provided for that purpose. In this way, substantially dry air was provided, the amount of moisture being practically uniform from day to day.

To William R. Jones we are indebted for a method of cheapening the cost of production of Bessemer steel. Prior to his invention the indirect or cupola process was generally used in this country. This process consisted in running molten metal from the blast furnace into pigs; these after cooling were carefully assorted, broken up and remelted in cupola furnaces from which the molten metal was conveyed to the converter for conversion into steel. Many attempts were made to eliminate the costly intermediate steps by supplying the converter direct from the blast furnace, but the fluctuations in the chemical composition of the metal from the blast furnace were such as to render the final product of the converter of uncertain character. The necessity for obtaining a uniform product will readily be appreciated when we consider the annual fatalities due to broken rails alone. The

ELIHU THOMSON
Notable for his work in electric welding.



C. E. SCRIBNER
A prolific telephone inventor.

CHARLES P. STEINMETZ
Alternating current machinery is his specialty.

problem was happily solved by Jones in a manner at once simple and efficacious. He conceived the idea of employing a large covered reservoir between the blast furnaces and converters which should receive the molten metal from the blast furnaces and maintain it in a molten state in such quantity that its average composition would not be materially altered by the addition from time to time of much smaller quantities of variable composition. From this mass of substantially uniform composition the converters were supplied, and the resultant steel product derived was substantially uniform. This invention illustrates in a forceful way the familiar fact that often the simplest expedient reveals the highest degree of invention, and also shows what small differences often lie between success and failure, for the chief difference between Jones' device and prior known devices resided in the size of his reservoir whereby he was able to obtain metal of substantially constant composition.

Perhaps nowhere is the efficiency of organized effort better illustrated than in the advances made in the arts by the engineering departments of the electrical companies.

In the telephone art appear such names as Scribner, a prolific inventor who has done much to standardize telephone installations, and Dean and Dunbar, to whom is due much credit for the development of the so-called two-wire switchboard system whereby the third wire of previous systems is dispensed with. Worthy of special mention, also, is the invention by Schellenger of the four-relay cord circuit, a form now widely used in many telephone systems, in which its use is held to be practically indispensable. Entitled to special note also is the invention by White of the so-called solid back transmitter, which has been a standard for many years.

Charles P. Steinmetz, head of the electrical engineering department of one of the large electrical companies, has done much constructive work in the electrical art, having made many important inventions in alternating current motors, generators, converters, regulators, lighting and the like, but perhaps his greatest contributions to the art are his remarkable mathematical treatises on the subject of alternating current phenomena, which are standard text books in electrical engineering, as well as books of reference for the practical engineer.

The mathematical accuracy of physical laws of action is well exemplified in the phase-transformer, independently invented by Steinmetz and Charles F. Scott, a prominent engineer of another company. This device, though structurally simple, would not have occurred save to one skilled in the mathematics of mechanics. The value of the invention lies in the fact that it enables current to be transmitted of a number of phases capable of the most economic transmission, and then, by the use of the transformer, to be changed to a number of phases best adapted to local needs, as from a three-phase transmission line to a two-phase motor. The transformer consists merely of several primary and secondary coils so connected and inductively arranged that the electromotive forces in the primary circuit are resolved into components corresponding to the number of phases desired, thus inducing electromotive forces of the same number of phases in the secondary coils, which supply the secondary circuit.

Dr. Elihu Thomson, one of America's leading authorities on matters electrical, is regularly employed by a large electrical company. His work on high potential and high frequency apparatus and also on electric welding is notable.

Many important inventions have been made in electric meters by Schellenberger, Pratt, Tingley, Conrad, Davis, Bradshaw, and other engineers of the various companies, while the synchronizer of Lincoln, which enables the phase and frequency of an incoming generator to be determined preliminary to connecting it to line, is also a valuable addition to its art.

Of particular importance among regulators for electric systems is the invention by Tirrill of the regulator which bears his name. The characteristic which renders this regulator of particular value is the quickness with which it acts to control the generator voltage responsive to changes in the load on the line.

Much progress has been made by the engineering corps of the electrical companies in the electrification of railways and interurban lines. Prior to the present decade direct current only was available for railway purposes. This could not be economically employed on the longer lines owing to the difficulties of transmission at ordinary voltages and the heavy sparking at the brushes encountered when higher voltages were used. On the other hand, alternating current, which can be efficiently transmitted to relatively great distances at ordinary voltages, could not be employed because no thoroughly satisfactory variable speed alternating current railway motor had as yet been devised. Within the past decade, however, not only has the length of direct current systems been increased by the employment of interpole generators and motors of efficient design, which has rendered the use of much higher voltages possible, but also the problem of the alternating current variable speed railway motor has yielded to the ingenuity of engineers in charge of construction work of this character, and successful variable speed alternating current railway motors are now in operation on many of our roads, notably the New York, New Haven and Hartford. Prominent among the inventors of this country in the development of the alternating current railway motor are Lamme, Alexanderson and Milch, while abroad much valuable work of a pioneer character has been done by such prominent engineers as Winter, Eichberg, Latour, Deri, and others.

Few fields have claimed more attention recently than that of lighting, and many important improvements in this art have resulted from the extensive experiments conducted by the well-organized departments of the various electric companies. Just and Hanaman have done much to develop the tungsten light, and Kuzel also has rendered efficient service in this line, the latter having invented the colloidal process for the manufacture of tungsten filament. The importance of the tungsten light will be readily appreciated from the fact that for the same amount of current it furnishes substantially 100 per cent more light than the ordinary carbon lamp. Prominent in the development of the flaming arc are the names of Steinmetz, Dempster and Ladoff, while the names of Steinmetz, Thomas, Weintraub, and Kruh are conspicuous in the development of the mercury vapor lamp which, owing to the uniform distribution of its light and the absence of sharply defined shadows, renders it admirably adapted for use in machine shops, drafting rooms, and like places, in which it has found extensive use. The mercury vapor lamp, suitably modified, is also used as a rectifier of alternating currents, especially in the charging of storage batteries from an alternating current source of supply, since it occupies little space and is inexpensive and simple in operation.

Further enumeration might be continued almost indefinitely, but the few instances selected will indicate to how great an extent the development of the arts is due to the inventor whose invention is often not associated with his name.

The First Trans-continental Aeroplane Flight

Account of the Record-breaking Aerial Journey by Calbraith P. Rodgers on a Wright Biplane

BY his arrival at Pasadena, Cal., at 4:04 P. M. on the afternoon of November 5th, aviator Rodgers practically completed his great trans-continental flight, although the real finish did not occur until several days later, when he flew the 25 miles remaining, and landed on the shore of the Pacific Ocean. Rodgers' start was made from the Sheepshead Bay race track, near Coney Island, on September 17th last. He started with the intention of competing for the $50,000 prize offered by the proprietor of a New York newspaper. The time limit within which this prize could be won expired on October 10th, but Rodgers flew on just the same, despite many mishaps and breakdowns. His total time to Pasadena was 49 days. The distance covered was some 3,350 miles, and the time in the air 82 hours. This corresponds to an average speed of about 40 miles an hour.

Besides breaking all records, aviator Rodgers carried with him letters from Postmaster-General Hitchcock. Several of these were delivered in Chicago, and others, including one from Major-General Grant to the Department of the Pacific, and another from the commanding officer of the Atlantic fleet to Rear Admiral Thomas of the Pacific squadron, were carried the entire distance across the continent and delivered.

We have followed the progress made by Rodgers from week to week in the columns of the SCIENTIFIC AMERICAN, and now that he has completed his flight, it will be interesting to summarize briefly and give the causes of his various delays. The two chief causes appear to have arisen from bad weather and breakdowns of the motor. He was forced to descend some eight or ten times on account of engine failures. Some of these were simple troubles, such as a wire coming loose or the fouling of a spark plug, but toward the end of his flight, at Imperial Junction, Cal., a connecting rod broke loose and punched a hole in the crank case, and Rodgers was obliged to replace the motor with a spare one which his special train carried. When starting from Middletown, N. Y., the second day, Rodgers fouled a tree and smashed his machine. This delayed him three days before he could effect repairs. At Hancock, N. Y., his next stopping place, he descended on account of slight engine trouble and was delayed half a day because of a storm. After flying 50 miles farther to Canisteo, he again descended on account of engine trouble. He mistook a marsh for a solid field and damaged his machine in alighting. The next day, however, he flew 99 miles to Red House, where he alighted to change a spark plug. In restarting, he ran into a wire fence, smashing his machine and propellers, which caused a two days' delay. Engine trouble is of course blamed for this, as if he had not alighted at Red House, he would not have collided with the fence there. At one other point in Texas, in starting on a narrow road, Rodgers smashed his machine by colliding with a fence. Two days were spent resting and overhauling the machine at San Antonio and El Paso, Tex., respectively.

All told, some 13½ days were lost making repairs, and of these, 2½ days can be laid directly to engine trouble. The weather was responsible for the loss of 11 days, so that a total delay of 24½ days was occasioned from weather and repairs. Deducting this from the total time of 49 days, we have 14½ days as the actual time of making the flight, which shows the possibility of crossing the continent in a month's time by aeroplane, in case one does not meet with bad weather and serious mishaps. It should be remembered that Rodgers chose a roundabout way, going far south into Texas and then following the line of the Southern Pacific Railway. He broke the world's long-distance cross-country record on October 10th, when he reached Marshall, Mo., after a flight of 214 miles, as he beat by a few miles Atwood's record of 1,265 from St. Louis to New York, which flight was completed on August 25th.

One of the important events in the course of his flight was his meeting with Robert G. Fowler at Tucson, Ariz. Fowler, it will be remembered, previously tried to cross the Rockies in his Wright biplane, but failed. On October 20th he left Los Angeles, determined to make the flight across the continent by the southern route. Up to November 6th, he had covered 825 miles in 16 days' time.

A comparison of Rodgers' flight with the first trans-continental automobile trip is interesting. The first attempt was made by Alexander Winton and Charles Shanks in 1901, but the Winton car was stuck in the sands of the great American desert. Two years later, however, Dr. H. Nelson Jackson and S. W. Crocker accomplished the feat of crossing from San Francisco to New York in a Winton machine, having a double-opposed-cylinder engine, in 65 days. A sing'e-cylinder Packard automobile, driven by Tom Fetch, accomplished the journey in 62 days, including a four-day stop at Denver, and an Oldsmobile, driven by L. L. Whitman, made the journey in 72 days. All three trips were made in the summer of 1903. The following year, Whitman and Harris crossed the continent from the Pacific to the Atlantic, a distance of 4,500 miles, in 33 days, thereby beating by 28 days, the best previous record; and in 1906 a 6-cylinder 30-horse-power Franklin air-cooled automobile was driven 4,000 miles across the continent in 15 days, 2 hours, and 12 minutes. This cutting down of the time to one-quarter in but three years shows the rapid development of the automobile from 1903 to 1906.

The aeroplane has developed so much more rapidly that two years ago the past summer, Oliesiagers remained aloft more than five hours and covered a distance of 240 miles, while of late distances of between 700 and 800 miles have been covered in a day with only a few stops. With a reliable motor, and the development of an automatic stability device which will enable the aviator to fly in windy weather, it should be possible to cross the continent in ten days' time, and without doubt this will soon be done. What a great time saver the aeroplane is was demonstrated time and again, especially in the far west, where Rodgers frequently out-distanced his special train by from one to two hours. Flying over mountains and canyons he found rather risky, but at the end of his journey he announced that Beachy's flight above Niagara Falls and down the gorge last summer was, in his opinion, the greatest flight ever made. The Wright biplane had for the second time broken the cross-country touring record.

Big Fortunes in Little Inventions

Men Who Saw the Importance of the Apparently Unimportant

By William Atherton Du Puy

EVERY time anybody in the United States pulls the cap off a beer bottle or a soda water bottle with the intent to quench a thirst, temperately or otherwise, he puts the fraction of a cent into the pocket of one William H. Painter, of Baltimore. A good many people have pulled these caps in the last few years and Painter is consequently an ever increasing millionaire. Yet the cap for bottles is a small thing, an idea crystallized and patented. The patent is the source of the millions.

Painter, however, carried his patent in his pocket for six years before he succeeded in interesting capital in its manufacture. Then a man of means advanced the necessary capital in return for a half interest in the patent and a company was formed. At the end of the first year he and Painter each had a net $27,000 in his pocket. Now the invention has crowded all other stoppers for fizzy water off the market and a big factory in Baltimore turns out the caps by the million every day.

Before the time of Painter there was a man by the name of De Quillfeldt who lived in New Jersey and who invented a stopper that took the trade away from the corks of our youth. This stopper was of rubber and was tightened by a wire attachment which was pulled down as a lever on the outside of the bottle. A decade ago they were generally used on milk bottles. De Quillfeldt is said to have made $15,000,000 out of his patent. He might have amassed a competence had it not been for William Painter and another equally clever person who fitted a piece of pasteboard into the neck of a milk bottle and took the business away from him.

An idea that is perhaps simpler than the pasteboard stopper is the "hump" on the hooks that furnish so much employment for married men just before theater time. Women had been fastening their dresses up with hooks and eyes for a generation and it is probable that some one had made a lot of money out of the original invention. But hooks had a way of coming unfastened much to the chagrin of the neat and fussy. Then came the genius of the hook and eye. A man who was wide awake despite his residence in Philadelphia, bent one of these hooks, so as to make a hump in it. He tried hooking it up and found that it remained hooked. He patented it and has monopolized the business through his "see that hump" advertisements ever since.

One day a man stood behind his wife while she put up her hair. The hairpins of those days were straight pieces of wire. They did not "stay put" very effectually. The woman in this case bent her hairpins before putting them in. Her husband saw her do it. The result was the invention of the crinkly hairpin which is to-day used in carload lots by the women of the world.

So important an invention as the telephone was made by turning a screw one-fourth of one revolution. All the millions that have resulted from the invention of the Bell telephone, depended upon this slight twist of the wrist of Dr. Alexander Graham Bell. There had been men before Dr. Bell who had come near finding a way to make female gossip and masculine commercial intercourse easier. The Reis patents came nearest success. But in the Reis patents the current was intermittent. It had to leap a gap. Dr. Bell closed that gap when he turned the screw. But Dr. Bell was not trying to invent a telephone when he incidentally stumbled upon his secret. He was working on a method of making speech visible, for his wife was deaf and dumb and he was seeking an easy method of conversing with her. Instead he found the method of talking over a wire to people at a distance. He did not patent the idea, however, and it knocked about his house for months. Finally he demonstrated it to some friends and they saw the possibility of its application. Upon their advice he patented the invention. His patent was filed at ten o'clock in the morning and at three in the afternoon another man applied for a patent on the same thing and lost a hundred million dollars by a nose.

Such are the stories that the veterans of the Patent Office gossip about in the moments of their leisure. They tell you, for instance, of the Selden clutch which is one of the vital patents that has much to do with the control of the automobile business of the country. It is this clutch that enables the operator of the machine to stop and start without having to get out and crank his machine—sometimes. It is interposed between the running gear and the motor, where it keeps the car marking time while the crossing is blockaded.

This clutch was invented before automobiles were. For a decade after its invention there was no opportunity of applying it to any good purpose. Then the automobile was invented. In fact George B. Selden was one of the early builders of automobiles and it is logical to suppose that he built them that he might make an opportunity to use his clutch. Certain it is that he long had a clutch on the automobile business. Before his patent was declared invalid about $2,000,000 had been paid by nearly ninety automobile makers, who found it cheaper to pay than to engage in expensive litigation.

Thaddeus Fairbanks was a New England farmer with long whiskers and much Yankee ingenuity. In his time old-fashioned steelyards were the only accurate means of weighing the produce of the farm. Platform scales were unknown, for nobody had ever worked out a method of arranging the levers that supported the platform in such a way that an object would pull equally no matter upon what part of the platform it rested. Old Thaddeus Fairbanks used to tell the story of the evolution of the arrangement of these levers. For a long time the problem was upon his mind. He used to lie awake nights and attempt to arrange those levers. It was in the dead of night that his thinking finally bore fruit. The arrangement unfolded itself and the Fairbanks scale was the result. So did a farmer practically monopolize the scale business of the world and so did he write his name upon platform scales wherever civilized man buys and sells by weight.

It was a man by the name of Hyman L. Lipman, likewise a resident of Philadelphia, who invented the rubber eraser that throughout our generation has been attached to the lead pencils in common use. It was in 1858 that the invention was made. In those times people talked in much smaller figures than nowadays. Lipman was, however, able to cash in his patents for a cold hundred thousand dollars when dollars went much farther than they do to-day.

So did a man by the name of Heaton, resident of Providence, notice that mother was occasioned a great deal of trouble because the buttons constantly came off the children's shoes. Heaton devised the little metal staple that holds on the shoe buttons of to-day and realized a fortune for his pains. No less clever was a man of the name of Dennison who pasted little rings about the hole in a shipping tag and thus made an "eye" that would not pull out.

Elias Howe conceived the idea of placing a hole near the point of a needle and under the encouragement of this small thought was the sewing machine developed. Howe was one of the Columbuses in the development of a machine to sew seams and deserves a monument from the women he emancipated from needle work. When he asked Congress to extend the term of his patent for a short time (one extension had already been granted) he admitted that he had collected $1,185,000 in royalties, but considered himself entitled to $150,000,000.

Howe had many followers who improved the sewing machine. One of the cleverest of these was the man who patented the stitch his machine made instead of the machine itself, and thus made infringements more difficult. Another man, Allan B. Wilson, a journeyman cabinet maker of Pittsfield, Mass., who dropped into the office of the SCIENTIFIC AMERICAN in 1849, exhibited the first model of what has since become known as the four-motion feed. He afterward founded the firm of Wheeler & Wilson and became immensely wealthy. In the SCIENTIFIC AMERICAN of 1849 James C. A. Gibbs saw a picture of Wilson's machine. The working of the device was clear down to the point where the needle perforated the cloth. He wondered what happened after that. Finally he decided to make the needle work. After much thinking and infinite whittling he worked out the ingenious little revolving hook which became the important feature of the Willcox & Gibbs machine and which made that firm wealthy.

The man who was born too early to wear, as a boy, red top boots with a brass tip across the toe, was also born too early to feel the true thing in the way of pride run rampant. Silverthorn brass tips, they were called, and they were most serviceable in preventing holes in the toe. Silverthorn made his fortune out of them.

There is a palatial mansion up the Hudson with a private yacht moored beneath the Palisades that is a monument to the millions that Adams made in the chewing-gum business. It was in 1871 that chewing gum was patented and millions of willing jaws have wagged industriously upon it ever since.

Harry Hardwick invented an ingrain carpet with the threads of it so interwoven as to prevent wrinkling, and Hardwick is now $4,000,000 better off for his pains.

A towel manufacturer found that his machinery was not working right and that his towels were suffering a vast tangling of the threads. While adjusting the machine he used one of the damaged towels to dry his hands. He found it pleasingly absorbent, and from the idea to which that gave rise was born the bath towel and a fortune to the patentee.

Charles Edward McCarthy was a blind man and lived in South Carolina. He devised a method of attaching mule power to a cotton gin and lived his life out in luxury and ease while the mules did the work.

The cast iron tombstone is a patented article that is to-day covering the graves of many of the dead and departed. It is effective and economical. It has amassed a fortune for its inventor and proven a solace to the mourning yet undecided survivors of the nation's dead.

R. R. Catlin of Washington invented a pattern cat that need but be stuffed with hay and sewed up to become a toy. Such figures as "Billiken" and such games as "Pigs in Clover" are always a fortune to the inventor if they become popular. The rubber return ball made much money both for the inventor and likewise for an infringing manufacturer who fought him in the courts.

The brass paper fastener which is still generally used for thick documents, was patented in 1867 by a government clerk by the name of G. W. McGill. Yet it was not new, for the Romans used a similar device two thousand years ago and the modern appliance was but a resurrection.

The patent for a typewriter lay dormant for half a century in France before it ever came into use. Then a man by the name of Sholes made a machine in this country and called it Remington. Another man named Brown made a different kind of typewriter and called it the Smith. The patentees immortalized other men by their work. They made millions and also made it much more pleasant for the editor who has to read copy.

The man who invented tin cans made it necessary for somebody to invent an opener. This was done and the money corralled. A can opener is not a very laborious thing in the using, but the public is always ready to pay for things that are made easier. So, just recently, an inventive genius made a can with a seam just below the top and when the owner wants it open he has but to strike it a blow where the seam breaks and the top is off. A single Chicago packer ordered ten millions of these cans as an experiment and others followed suit. The inventor has a fortune, and the thing is but just begun.

So does the story of the making of big fortunes out of patents on very small and apparently unimportant things pyramid as one goes into the subject. There is a current belief to the effect that but few of the many patents issued are of any practical value. The writer had occasion recently to look through a series of the issues of the Patent Office *Gazette* and was struck with the number of patents and found that one in three was assigned, this meaning that a third of all patents issued were sold before completed. These patents must be of value or they would not sell. There are others, of course, that are of value that are retained by the patentee. So it would, on this basis, seem reasonable to estimate that half the patents being issued are of value. Many of them are of stupendous value. An estimate of the revenue being to-day received from patents of the United States would be impossible to make but it seems safe to say that many of the great staple crops will have to look to their honors if a census of patent profits is ever taken.

Silk Growing in the Philippines

THE Philippine Bureau of Science is making a determined effort to introduce the growing of silk in the Philippines, not only for the purpose of increasing the productive possibilities of the islands generally, but also as a means of furnishing silk for use in connection with industries already established. Thus considerable silk is used in the weaving of various forms of the well-known "jusi," or pineapple-fiber cloth, for which the Philippines are famous, and ninety-five per cent of this silk is now imported from China.

The trailer now rotting away at Menlo Park.

Edison's Pioneer Electric Railway Work

By T. Commerford Martin

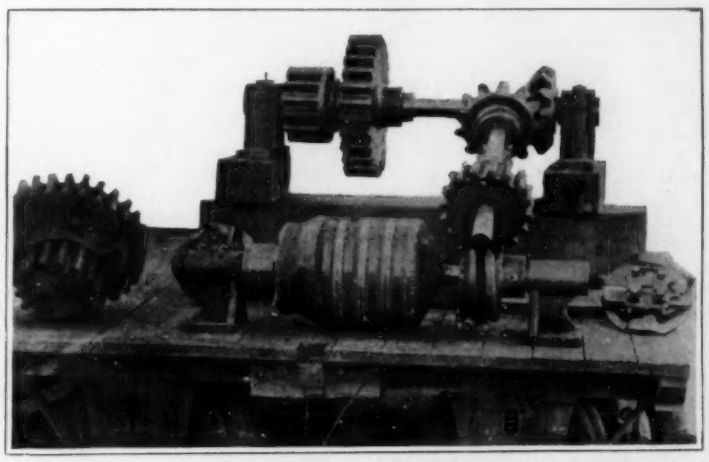
Ruins of one of the trucks.

MENLO PARK, New Jersey, is associated in the popular mind, more perhaps with the incandescent lamp than any other invention; but there also Edison did his great and original work on the telephone, the phonograph, and the electric railway—not to mention a few other things of importance. There does, however, seem to be a general tendency to insist that a man shall have no right to more than one invention, as a basis for fame, just as monogamy is a basis for offspring. Morse for the telegraph, Brush for the arc lamp, Edison for the incandescent lamp, Bell for the telephone, Sprague for the electric railway, Stanley for the transformer, Tesla for modern power transmission, Thomson for electric welding, Marconi for the wireless, Weston for meters—that is about the way the territory of electrical invention is supposed to be roughly divided up. Yet most of these men have done more than one big thing; and in each of the domains there have been other notable figures.

Looking back these thirty years, one might perhaps wonder what Edison was doing with the electric railway in 1880, when he had already so many other inventive troubles on his hands; but no kind of preoccupation ever prevented Edison from taking up a novel idea that challenged his insatiable curiosity and his passion for experiment. Besides, the air was full of a trusting belief that to electricity all things were possible. The successful introduction in quick succession of the quadruplex, the telephone, the dynamo, and both forms of the electric light, was an immense stimulus to other endeavor; and the problem of perfecting and utilizing the electric motor haunted every aspiring imagination. Edison's ambition would have required a straight jacket to keep it away from such an opportunity.

In these days, when long stretches of main railroad are electrified and when every large steam terminal is under sentence of death, as obsolete, it is hard to believe that the beginnings were so crude as the pictures herewith show them to have been. But it had been very much that way for fifty years prior, back to the work of Davenport and Davidson; and one may feel amazed that although so much had been done it all amounted to so little. Evidently a new point of departure had been reached with new men; from whom both in Europe and America real progress must date.

Edison had plenty of spare land around him at Menlo Park, and the adjacent country was not preoccupied by intensive cultivation. Hence it was easy and inexpensive to lay out a single track about one-third of a mile in length which ran from the laboratory along a country road, flanked a hill and came back like a belt to its buckle. The rails were "second" street car rails, and anybody who remembers the street railway construction of the early eighties will not contradict the assertion that the "irons" could not have been much worse. The gage of the track was about three feet six inches, laid with ordinary sleepers on the natural grade. To these sleepers the rails, insulated with tar canvas paper and other stuff not much more effective, were spiked. There were various sharp curves of dangerous short radius, and the hill gave the chance for a nice grade of about 60 feet in 300. It was all delightfully amateurish, but enthusiasm and serious intent carried through.



Worm gear drive and armature.

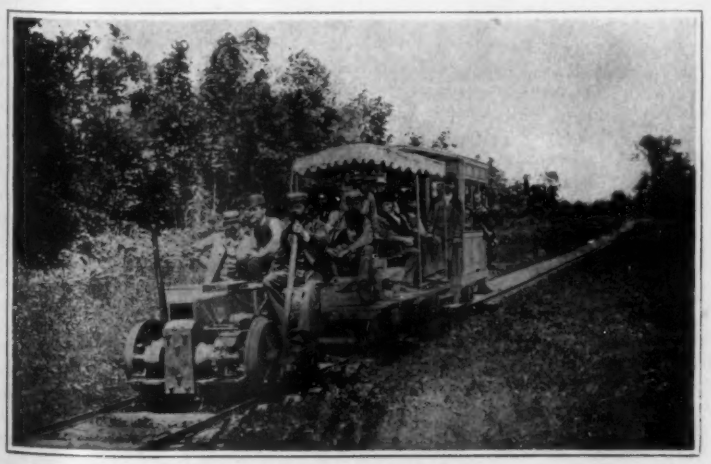
The power plant consisted of two of the small lighting dynamos then being built at the laboratory, each of about 12-horse-power, and the electrical energy was conveyed from them to the track by underground conductors, for which Edison always had a keen predilection as against overhead wires. About 75 amperes at 110 volts was the yield of each machine, so that subject to track losses, not to exceed 25 horse-power, was available at the motor. As with his lighting, Edison's traction system was operated in parallel.

The locomotive was worthy the rest of the equipment. It was a four-wheeled iron truck, an ordinary flat dump car, some six feet long and four feet wide. On this chassis, another of the "Z" dynamos of 12-horse-power was mounted as a motor, laid on its side. The armature end projected in front of the locomotive and the rotative movement was transmitted to the driving axle by means of friction pulleys. The wheels of the locomotive had metal rims and a central web of papier maché or wood. The current was taken up from the track on one side by contact brushes, from the wheels, through a brass hub to the motor; and the return circuit was completed through the other set of wheels., i. e., the motor was in parallel. It had its field magnet circuit in permanent connection as a shunt across the rails, with a safety fuse in the shape of a bit of bare copper wire; while a switch in the armature circuit gave the motorman ability to reverse the current flow in the armature and thus reverse the direction of the locomotive.

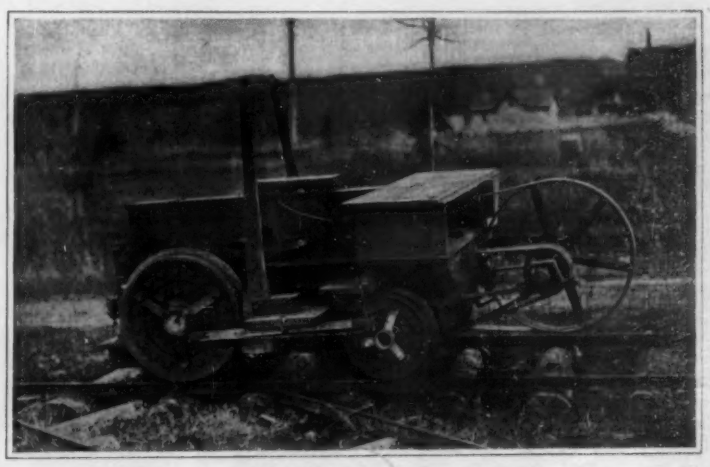
As one might expect now, though it was not so obvious then, this friction gear was not able to stand up under the strain put upon it, especially when all the "boys" in the shops piled on like rush hour passengers in the subway. May 13th was the day in 1880 when the road was thus tried out, and it was a memorable date at the "Lab," as well as in the history of electric traction; for Edison was thus applying many of the principles of the multiple arc distribution now universal, as well as the low internal resistance dynamo with its high resistance field.

For mechanical transmission, Edison next resorted to belts, and the armature pulley was belted to a countershaft on the locomotive frame, while the countershaft was belted to a pulley on the car axle; and there was an idler pulley for tightening the axle belt, worked by the lever which had previously thrown the friction gear into adjustment. As the motor was started, the armature came up to full revolution, the belt was tightened on the car axle, and the locomotive moved off. But there was a lot of slip, the rubbing of the belts caused serious charring; and if on the other hand the belt was suddenly tautened up, the armature was burned. The odor of burnt armature was grimly familiar during the tests. The next step in the evolution was to employ a series of resistance boxes in the armature circuit. The locomotive would be started with all of these "cut in" and then it was brought up to full speed by cutting them out successively. After loading up the locomotive with a generous superabundance of these boxes, Edison came to the conclusion that he was carrying a lot of unnecessary dead weight. He, therefore, dispensed with most of them very ingeniously by winding copper resistance wire around one of the long legs of the motor field magnet. There it occupied no space, was inconspicuous, served as an additional field coil in starting up the motor, and proved an important advance. This coil was also in

(Continued on page 465.)



The electric train of Menlo Park.



The belt-driven electric locomotive.

EDISON'S PIONEER ELECTRIC RAILWAY WORK

Perpetual Motion

Some Examples of Misguided Ingenuity

OUT of nothing, nothing comes. This is really a wonderful axiom. Men will grant it at once as an abstract proposition. But when they apply it to real things, some seem to get confused, and entertain expectations which if realized would set this axiom at naught. The same general truth is expressed by the statement, *Every effect must have a cause.* This, too, will be granted by pretty much everybody, until application to real things is made.

Perhaps no one has trouble with a case where there is absolutely nothing at all. From a space where there is no matter, whether solid, liquid or gaseous, no one will expect anything. But juggle matters a little. Put in *A*, put in *B*. Suppose it to be known just what *A* will accomplish, and what *B*. And suppose, further, that we have found, subsequent to our combination of *A* and *B*, that we can trace these accomplishments of *A* and *B*. Call them *a* and *b*. Now right here is where some seem to go astray. They seem willing to believe that in addition a new thing, *c*, might *somehow* turn up. Well, if it should, then we will have a case of something coming from nothing. We might, just as well, expect that sometimes 2 and 2 would produce 5. The additional unit here would be no more wonderful than *c*.

This is the trouble with the seekers after perpetual motion. They really expect something from nothing; they expect an effect without a cause to produce it. They take a machine (*A*) and a certain amount of energy (*B*) and expect that somehow the combination will give rise not merely to the machine itself (*a*) and a total of energy (*b*) equivalent in amount to what they put in (*B*). They expect not merely *a* and *b;* they look for an additional energy *c*. If they get it, they will get something out of nothing; they will get an effect without a cause behind it. It is just as ridiculous as expecting to get 17 separate ounces of metal by cutting up a pound of steel. Just as soon as one thoroughly grasps the idea that energy is a real thing, he is prepared to understand that it cannot be increased by manipulating it. He is then ready to see that, if he puts 2 foot-pounds into a machine, he cannot expect to get 2½ foot-pounds out. Indeed, he may apparently get *less* than 2, because some of the energy will be transformed into heat and will be radiated off and thus may escape observation.

However, men have been working at the impossible problem of getting something out of nothing for hundreds of years. And, some are probably still at it. No doubt, there are to-day, men in the United States who think that a machine can *somehow* be made, which will run without energy being constantly put into it. It is just as if they expected to cut the 8-inch square into two separate parts, and get a 5 x 13 inch rectangle by putting these parts together in a different way.

That the possibility of a perpetual motion machine has not been entirely given up will be understood when it is learned that 575 application for patents for such apparatus were made to the British Patent Office in the period 1855 to 1903. This is about ten patents a year.

In Fig. 1 we have an example cited by Mr. F. F. Charlesworth of the British Patent Office. An endless band or chain is arranged to mesh with two sprocket wheels. The band carries a series of cups, or rather dippers so attached that the handles are continually perpendicular to the band. Heavy balls are fed one by one to the open dippers on the descending side. When the dipper nears the bottom, a projecting horn intercepts the ball and guides it away. It will be seen that this machine will run as long as the balls are fed in at the top. In the form shown, an elevating screw is used to bring the balls to the top and permit their use over again. This endless screw is driven by mechanism connected with the shaft of the upper sprocket wheel. The thing lost sight of here is the fact that it will require as much energy to lift the ball to its initial position as it will develop by falling. It was proposed, apparently for this same machine, to provide for the return lift of the balls by conducting them along an incline to a hollow tower filled with quicksilver or some other liquid. Once a ball had entered the base of the tower, it would rise to the surface of the quicksilver because of the difference in specific gravity. It could then be recovered by a lifting device, dropped onto an incline and fed into the machine again at the top. A very fine scheme—the only difficulty lay in getting the balls into the bottom of the quicksilver column.

Consider now Fig. 2. We have here a similar arrangement to that shown in Fig. 1. However, the endless band is here of rubber and hollow. Instead of dippers, there are hollow rubber projections or arms. On the following side of each of the arms, conceiving the whole to turn with the hands of a watch are air-sacks. To these weights are attached. When an arm is rising and the weight is consequently underneath, there will be a distension of the sack. This entire apparatus is immersed in water. It is expected that it will now begin to move clockwise. The rising side is lighter than the descending one because the distention of the air-sacks has decreased the specific gravity on the one side. All air compartments communicate with the main tube. There is no change in the tension of the air. As a weight at the top passes into the position where its sack collapses, another sack will be distended at the bottom, and so the air required will have the same volume. At any rate, this is the general scheme. But why won't it work? The reason lies in the progressively increasing pressure of water as one passes downward beneath the surface. It is this that should raise the distended side. But it is also this that resists the movement of air from the top to distend an air-sack at the bottom. The distension of the air-sack at the bottom is broadly the same problem as introducing a metal ball into the bottom of the column of quicksilver.

Refer now to Fig. 3. This represents what appears to have been a French "solution." An air-tight bellows *DFE* is arranged on an axis perpendicular to the paper. The total length of the bellows is about 40 inches. There is an aperture at *E'*, by means of which and a suitable tube there is a communication between the interior of the bellows and a vessel of mercury *G*. This vessel is fixed in position at about the level of the shaft on which the bellows turns. *B* is a counterpoise, while *C* is a clasp which serves to retain the bellows in position with a moderate amount of strength. Suppose now the bellows to be forced open, say, to a third of its capacity. Quicksilver will flow from *G* and after a time, so it is claimed, the weight within the bellows will exert a turning effort sufficient to cause it to break away from the clasp. The lower end of the tube *E* will continue in the mercury bath. The entire movement will be arrested at the position shown in Fig. 4, and another clasp *H* will engage the bellows. The mercury rose before, because of the height of the tube *E* being less than that of the usual barometric column. The mercury now will run out from the bellows and the latter will collapse. The counterpoise *B* then operates to bring the bellows back to its initial position. Arrived here, whatever mercury remains within, falls to about 27 inches height, whereupon mercury from the reservoir will rise to flow into the bellows, because the length of the tube *E* is considerably less than 27 inches. This is essentially Dr. Papin's account of this scheme. What is wrong with the device?

Consider now Fig. 5. Here we have a drum filled with water or other liquid and arranged on trunnions. Upon one of the trunnions, a fly wheel is mounted and a suitable belt carries the power from the generator of perpetual motion. By means of stuffing boxes two rods pass through the drum. These rods are mutually perpendicular. Weights are arranged on the ends of these. It will be understood that if we could always have the same amount of weight on the two sides of a drum or wheel, but the weight on one side so managed as to be further from the axis of rotation, the wheel or drum would turn. The excess of leverage on one side would cause that side continually to descend. To manage this shifting of the weights, the inventor provided the rods with cork spheres centrally arranged. Evidently when the one rod is vertical, its cork float will, if suitably dimensioned with respect to the two weights, cause the upper weight to rise and so project from the drum at a maximum distance. There will be no tendency for this position to be lost until after this vertical rod has taken up a horizontal position. The condition shown in the figures is where one rod is vertical and the other horizontal. The vertical rod and its weights will, apart from previous movement, exert no turning effort. But the horizontal one will, since one of its weights is farther from the axis than the other. Motion will be set up in the direction of the arrow. Of course the rods must be so arranged as to prevent interference between their cork floats.

A simple device is shown in Fig. 6. An endless chain passes around two wheels *BB*. A trio of idle wheels *CCD* deflects the chain from the vertical on one side. The result here is that a greater length and consequently a greater weight of chain are continually on the right-hand side. Presumably, we have a clockwise movement here. The difficulty is that the deflected portion, although heavier, does not exert the full effect of its weight. The gravitation of the chain operates downwardly in an exactly vertical direction. But since this gravitative action is compelled to act, say, on the topmost wheel, at an angle, there is some loss. To make this perfectly clear, suppose a chain to hang precisely vertical. At the point of tangency the gravitative pull will be in the direction of the tangent and therefore most effective. Deflect the chain in or out, and the gravitative pull will be at an angle to the tangent and so at some loss. In point of fact the axles of the wheels *BCB* sustain a certain fraction of the weight of the chain.

Consider Fig. 7. Three rotatable shafts are arranged horizontally so that a vertical section would show the shaft sections at the vertices of a right-angled triangle, as disclosed in the figure. Suppose now that an endless chain be arranged to envelop these rollers. It might be thought that, since the hypothenuse is longer than the vertical side, a uniform chain would set up a clockwise movement. The explanation just given, however, prepares us to understand that this will not be the case. In fact the disadvantage under which the gravitative pull of the hypothenuse is delivered is just compensated by its excess of weight. Such an arrangement will be a well-balanced, immovable one. But suppose that the metal chain be replaced by a band to which sponges are attached, the whole being enveloped by a string of evenly distributed weights. Suppose, in addition, that the horizontal portion of the apparatus be immersed in water. We now have a device conceived by Sir William Congreve, probably about 1827. Sir William was a member of the British Parliament and the inventor of the celebrated Congreve rockets. This machine was expected to turn counterclockwise. The *modus operandi* was conceived to be as follows: On the vertical side a sponge as it entered the water would be uncompressed by the string of weights and therefore free to absorb water by capillary attraction. As a sponge emerged from the water at the lower end of the hypothenuse, the line of weights would operate to compress it and thus keep it comparatively dry. Because of the difference in weight on the dry and wet sides, the whole system would move.

Perhaps the most celebrated efforts in the direction of perpetual motion have been made in connection with the continued distribution and redistribution of weights within or about a wheel movably mounted upon an axle or trunnions. The purpose is to have the same number of weights upon the downgoing and upgoing sides, but to have the average distance from the axis of rotation greater upon the downgoing side. It is conceived that, on the principle of a difference in leverage exerted by the two groups of weights, we should get a never-ceasing motion, if this relation could be perpetually maintained. One of the most distinguished of those who gave attention to this matter was the second Marquis of Worcester who flourished about the middle of the seventeenth century. This gentleman wrote in his "Century of Inventions" of a device whose purpose was "to provide and make that all yᵉ weights of yᵉ deſcending syde of a wheele shal be perpetually further from yᵉ center, then thoſe of yᵉ mounting syde, and yett equall in number and heft on yᵉ one syde as yᵉ other. A moſt incredible thing if not scene, butt tryed before yᵉ late King of happy and glorious memorye in yᵉ Tower by my directions, two Extraordinary Embaſſadors accompanying his Maᵗᵉ and yᵉ D. of Richmond, D. Hamilton, and moſt part of yᵉ Court attending him."

He goes on to relate that the wheel, or drum, was 14 feet in diameter and was provided with 40 weights of 50 pounds each. When this wheel was put in motion, it was claimed, so it seems, that as the weights successively passed the vertical diameter above they hung a foot further from the center, and that as they passed this diameter on the lower side they would hang a foot nearer. It would seem that the precise method by which this result was accomplished is not certainly known. However, it is thought to be substantially as indicated in Fig. 8. It will be seen that the distribution to right and left is about equal, so that so far as mere weight is concerned, we have a balance. But there is a preponderance of leverage on one side. The view represents the position at a certain definite instant. And we may grant that this instant displays conditions in a fairly typical manner. It would seem then that the Marquis was perhaps justified when he said, "Bee pleafed to judge ye conſequence."

Half a century or thereabouts later, a celebrated apparatus was constructed more than once by Jean

(Continued on page 468)

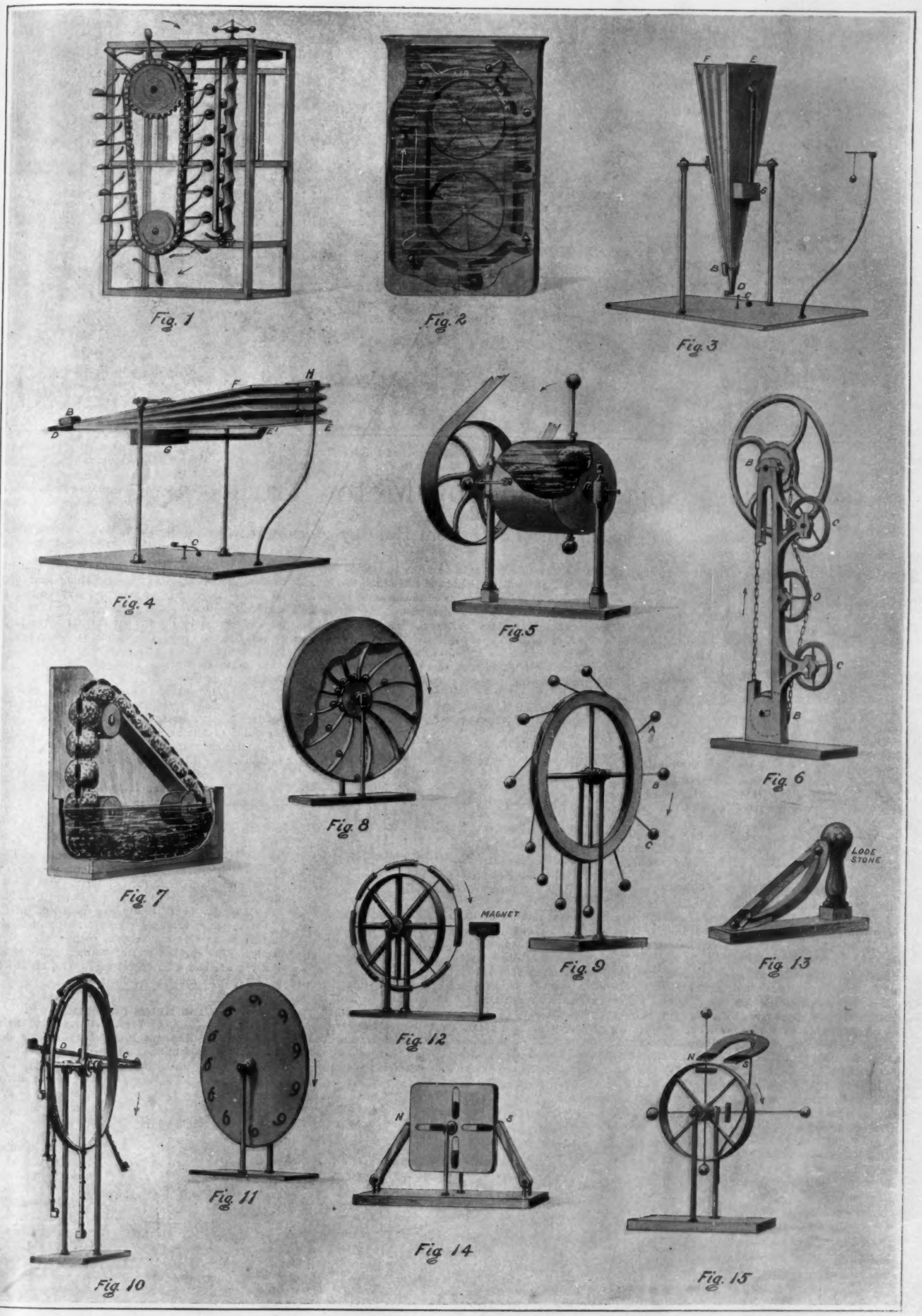
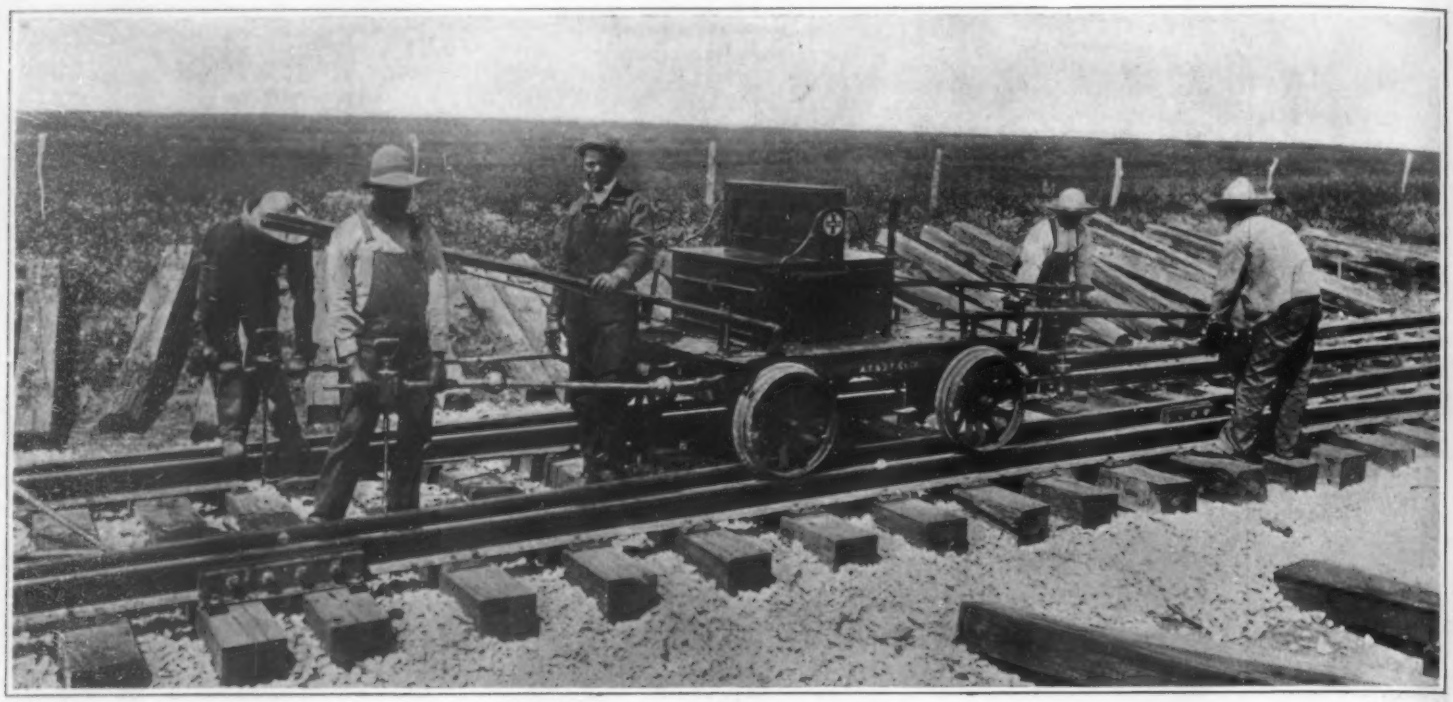


Fig. 1. Ball and cup gravity machine. Fig. 2. Collapsing-pocket hydrodynamic machine. Figs. 3 and 4. A fantastic form of machine, to be actuated by vacuum and mercury. Fig. 5. Float and sliding dumbbell engine. Fig. 6. Chain gravity machine. Fig. 7. Capillarity engine. Figs. 8, 9, 10. Three forms of gravity perpetual motion wheels. Fig. 11. A suggestion quite as practical as any; the nines outweigh the sixes. Figs. 12, 13, 14, 15. Magnetic perpetual motion machines.

SOME EXAMPLES OF MISGUIDED INGENUITY



A gang at work with the self-propelled spiking truck.

Spike Driving by Motor Truck

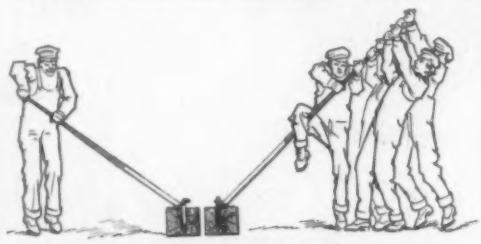
Protecting the Public from Railway Accidents

THE number of ties required annually for renewals and new track by the railroads of the United States is estimated at 154,000,000, which, at an average cost of 50 cents apiece, represents the enormous sum of $77,000,000. Less than half of these, an ever-lessening supply, are hardwood. Soft wood ties become unfit for service from decay, chiefly of the fibers under the rail, where the wood is cut and injured by the rough nail spikes with the continual up and down play of the rail and spike. When we remember that any loosening of the spikes, with consequent spreading of the rails, is liable to lead to most serious accidents and loss of life, the importance of the problem of thoroughly securing the rails to the ties becomes obvious.

Screw spikes have been introduced with much advantage in place of nail spikes. In the first place, the screw, in entering the wood, does not injure it to the same extent as the nail spike; secondly, an item of no small importance, a screw spike has about four times the holding power of a nail spike, as indicated diagrammatically in one of our illustrations. This greatly lessens rail movement with the resultant loosening of the spike and laying open of a cavity in the wood, into which rain and moisture penetrate.

One of the principal obstacles which have hitherto stood in the way of general adoption of screw spikes in this country, has been the expense of putting them in by hand labor and with primitive tools. But this obstacle is one which can be and has been removed. Our half-tone illustration and one of the line drawings illustrate a self-propelled gasoline motor car which is in service boring ties and inserting screw spikes by mechanical power. This not only reduces the cost of spiking to a minimum, but also greatly expedites the operation of track laying and re-spiking.

The motor car is provided with cranes at the drilling end, which hold the drills when not in operation. At the spike-driving end similar cranes are provided, which hold up the spike drivers at all times. These cranes not only take up the whole of the weight of the instrument, but also the torsional thrust, so that the operator is merely required to exert a downward pressure on the tool, to keep the spike driver from slipping off the head of the spike, and to move the driver from one spike to another. The spherical bulb near the bottom of the instrument, seen on the right-hand side of the line drawing, is a friction clutch adjusted to slip when the spike has been screwed in to the desired degree of firmness. Without this friction clutch the engine would be stalled or the head of the spike twisted off. The spike driver is connected to the motor by a telescoping shaft of such length that three ties can be reached without moving the car. The work of boring the holes is effected ten times more rapidly with this equipment than by hand, and requires less skill, and

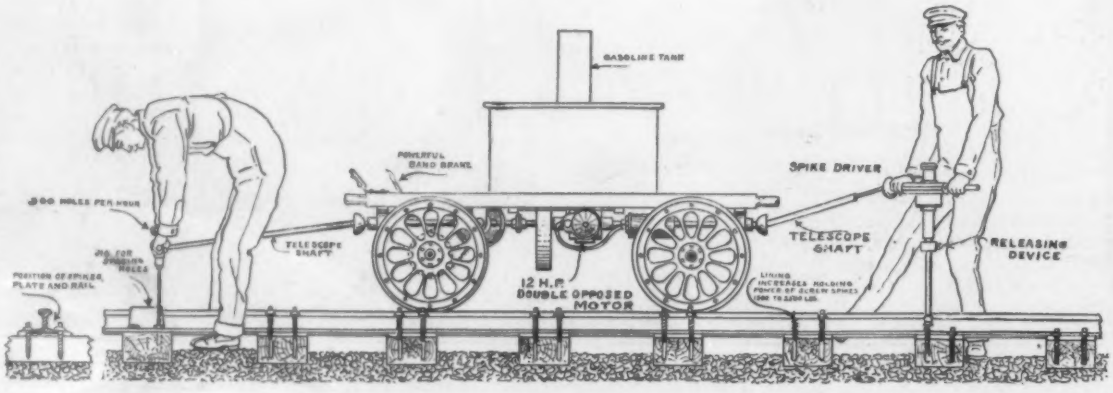


The screw spike has four times better hold than the nail spike.

of course much less effort. The cost of labor also is greatly reduced. The car is kept on the track throughout and is advanced just as fast as the spikes are screwed into place. When not in use the drill and extension shaft are hung in the hook of the crane. The modern standard track laid with this gasoline motor car consists of 110 pound rails, carried on tie plates and fastened by means of screw spikes to treated ties. The gasoline engine is sufficiently powerful to haul when necessary two or three cars loaded with section men and their supplies, such as jacks, claw bars, lining bars, shovels, ties and rails. A specially designed friction clutch in the connection between the engine and the propelling gear of the car makes it possible to start a heavy load from a standstill without stalling the engine. The clutch may, of course, be thrown out entirely when the car is standing still and the engine is being used for spike driving. There is no doubt that the car will find many other applications beside that for which it is specifically designed. If run in conjunction with a small auxiliary air compressor or electric generator, it will be handy for operating rivetting hammers or similar tools at a distance. It might be used for spraying paint or mixing concrete. By adding a suitable blade attachment the car may be turned into a mowing machine for cutting grass and weeds from the right of way, or it may be used to operate mechanical tamping bars which are being developed in connection with this outfit.

One of the valuable features of the car is its great simplicity. A lever in the hands of the operator controls the motion forward or backward. The throttle and spark control levers are on the seat just behind the operator's right knee, while a lever under his foot operates the brake. At the back of the seat is a gasoline supply tank which holds a sufficient quantity of the oil for ten hours' continuous operation.

The motor is arranged crosswise, a position which is said to provide a maximum cooling effect during motion. The car has started without difficulty on a heavy grade and a 23 degree curve with all the men on board who could get a foothold.



Diagrammatic view of the boring and spike-driving truck.

SPIKE DRIVING BY MOTOR TRUCK

The Kubus of Sumatra

PROF. W. VOLZ, of Breslau University, has published in *Petermanns Mitteilungen* a paper on the Kubus, who live in the interior forests of Sumatra, and, owing to their complete isolation by several natural barriers, appear to be a typical example of an absolutely primitive race. The life of the Kubus is comparable to that of the anthropoid apes (gibbons), which inhabit the same forests; they appear to be at the lowest stage of economic development—the gathering stage—having not yet become hunters. Prof. Volz believes that they totally lack religious conceptions.

Welding a Fourteen-inch Shaft by the Thermite Process

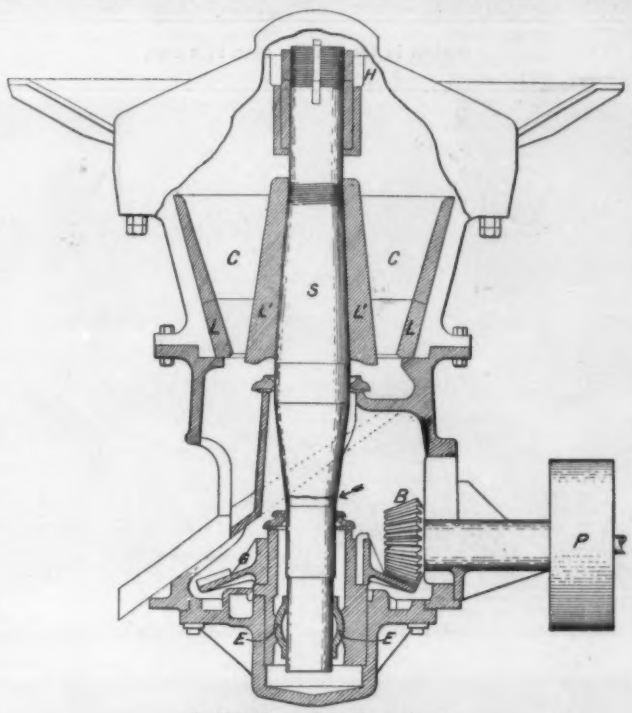
A Fine Example of the Adaptability of Dr. Goldschmidt's Method

THE Goldschmidt thermite process has now become so firmly established in various industries, that we accept it more or less as a matter of course, and have almost ceased to be stirred by the spectacular liberation of energy which accompanies its application to various purposes of ordinary industrial use. When, however, such a gigantic operation as the welding of a fourteen-inch shaft is in progress, even the most cold-blooded witness must wonder at the fierce intensity of the reaction and at the perfect control under which it is kept. Most violent reactions are explosive in character, owing to the disengagement of large volumes of heated gas. The thermite reaction has the great advantage that all substances taking part therein, both the initial material and the products, are solid.

A rock crusher belonging to the North River Stone Company, Kingston, N. Y., was recently disabled by the fracture of the central shaft. The construction and mode of working of this crusher can be gathered from the accompanying illustration. A vertical shaft *S* is suspended from a head *H*, and extends axially through the crusher-chamber *C*, the walls of which are faced with a lining *L*. A similar lining *L'* is placed around the working face of the conical portion of the shaft. The latter, at its lower extremity, is held in an eccentric bearing *E*, which is rotated in the casing of the crusher by the gear *G* through the beveled pinion *B* and pulley *P*. The motion of the shaft is that of a conical pendulum, that is to say, its upper extremity is fixed, while the lower end travels around in a circle. There is no rotation about the axis of the shaft. The rock is fed into the crusher-chamber, and is there ground between the lining of the hopper-walls and the sleeve of the shaft, as the latter revolves in its eccentric orbit, thus periodically approaching toward and receding from a given point of the chamber wall. The ground rock issues at the side by a chute. The break occurred near the point where the lower cylindrical portion of the shaft joins the tapering conical part. (The location of the fracture is indicated in the drawing by an arrow.) The shaft here measures 14 inches in diameter, while at its thickest part it is 22 inches across. The total length is 18 feet, and the weight about seven tons.

The accident to the shaft meant a period of idleness of at the very least six or eight weeks if a new shaft were ordered. The owners of the plant therefore turned their thoughts to the possibilities of repairing the damage by the aid of the Goldschmidt process. This plan was ultimately realized with a saving of several weeks' time and at about one-third the cost of a new shaft. The broken member was shipped to the works of the Goldschmidt Thermite Company, at Jersey City, The fractured surface was pared off with the oxygen blast, taking away in all about 2½ inches. The two portions of the shaft were then mounted upon a solid concrete bed, so as to secure perfect alinement, with the space of about two and one-half inches left open between the two ends that were to be welded.

The first step toward effecting the weld is to prepare the mold. For this purpose a wax pattern of the finished joint is first formed about the ends to be joined, and the mold, of equal proportions of fire clay, ground fire brick, and fire sand, is then built up around the shaft, leaving of course channels for pouring in the charge, a riser to allow for the contraction of the cooling metal, and a blast hole, for the introduction of a gasoline compressed-air torch, to preheat



Section through rock crusher,
The shaft broke at the point marked by an arrow.

the mold and casting before welding. During the actual operation this blast hole is plugged. The mold is enclosed in sheet iron walls, and this completes the welding furnace.

During the preheating, which occupied in this case about ten hours, the wax pattern of course melts away, leaving a free space for the metal of the welded joint. About the furnace is built a wooden scaffolding of trestles, which supports the hoppers containing the charge of thermite, as seen in one of our illustrations. It may seem odd that wood should be used for this structure, since it has to withstand not only the heat of the furnace during the preheating operation, but also the assault of the spattering charge and slag during the reaction. As a matter of fact wood serves its purpose quite satisfactorily, for though it has to be continually watched and kept moistened, and is pretty sure to catch fire during the reaction, it holds up very well even under these strenuous conditions, while an iron structure would be cut right through by any of the molten charge falling upon it. The charge consisted of 1,100 pounds of thermite, mixed with 25 per cent of small steel punchings, 1 per cent of chromium thermite, and 1 per cent pure carbon-free manganese. This charge of thermite, exclusive of steel punchings, is about enough to make 600 pounds of steel. The reaction temperature is about 5,400 deg. F.

After adding a teaspoonful of ignition powder (barium peroxide and aluminium flake) to each hopper, the reaction is started by introducing a red hot iron bolt. A flash, a glare, a hiss and sputter, and clouds of smoke envelop all, as the elements wrestle in fierce combat for union with the coveted oxygen: the greater affinity of the aluminium quickly asserts itself, and after a forty seconds' round the iron is vanquished, thrown out of combination and enslaved in the service of man. About one minute is allowed to lapse in order to allow the slag to separate, then the tap-holes of the hoppers are pushed open, and the white-hot molten charge runs into the mold, filling the space prepared for it, and effecting the union of the adjoining ends of the broken shaft. The main part of the work is now done. It only remains to allow the iron to cool—a matter of some forty hours—and the mold can be broken away, exposing the welded joint to view. The excrescences left by the pouring holes and the riser are cut off with the oxygen blast, and the job is completed—for in this particular case there is no need of machining the welded joint.

The repair of the crusher shaft was thus effected with complete success, giving one more striking example of the wonderful possibilities of the Goldschmidt thermite process.

Horse-power and Man-power

IN connection with steamship propulsion the average man is apt to speak very glibly of so many hundred, or thousand, horse-power. But, says the *Railway and Locomotive Engineering*, it is extremely doubtful if one person in a hundred really has a due appreciation of what the phrase actually means. On this point some very interesting remarks were made at the last annual dinner of the Scottish staff of *Lloyd's Register* by Mr. John Heck, the Glasgow engineer surveyor to the society. Proposing the toast of "shipbuilding and engineering," he said that, calculating the strength of twelve men to be equal to one horse-power, it would require 840,000 men to produce as much energy as the 70,000 horse-power developed by the turbine machinery of the express Cunarder "Lusitania." Then, if the men were to work on the eight-hour day system those figures would give a total of 2,520,000, that being the number of men whose strength would be necessary to drive the vessel across the Atlantic Ocean. So it would take all the men in Scotland to supply the energy produced all the day round by the wonderful turbine machinery of this great ship.

Preheating the shaft. The crucible and mold box are shown in position.

Finished weld showing metal left in gate and riser.

WELDING A FOURTEEN-INCH SHAFT BY THE THERMITE PROCESS.

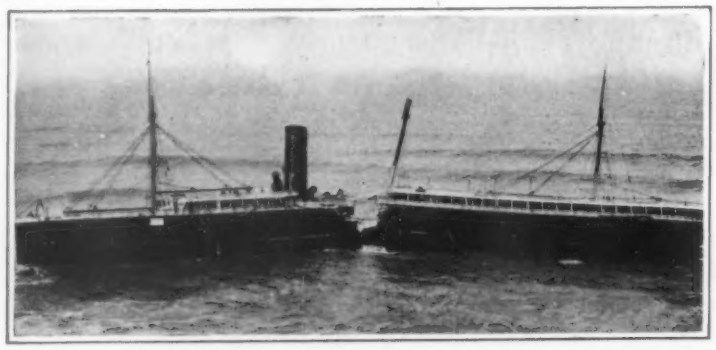
Curiosities of Science and Invention

A Vessel Broken in Two

THE accompanying photograph shows the wreck of the steamship "Santa Rosa," belonging to the Pacific Coast Steamship Company, of San Francisco. For some years past, the "Santa Rosa" has been plying between San Francisco and San Diego, on the coast of Southern California. While on a voyage to the latter port, the vessel veered from her usual course, during heavy weather, and very early on the morning of July 7th, she piled up on the rocks of Point Arquello, near Santa Barbara. At the time, the steamship carried about 200 passengers, and a heavy and valuable cargo.

Four vessels very soon came to the rescue of the "Santa Rosa," and strenuous efforts were made to pull her off of the reef. Hawsers were hitched to the stern of the steamer, and the four vessels began tugging away. A heavy sea was running and the rocks on which the vessel was lodged, were very ragged and sharp. Between the rocks and the angry sea, the "Santa Rosa" broke about amidship, but still hung together. However, the enormous strain of the four tugging vessels, was so great, that the steamship was literally pulled in twain—just as she appears in the photograph—making a very odd-looking wreck—one of the most peculiar ever seen on the Pacific Coast.

Both stranded steamer and the cargo proved a total loss.



Broken in two on the edge of a reef.

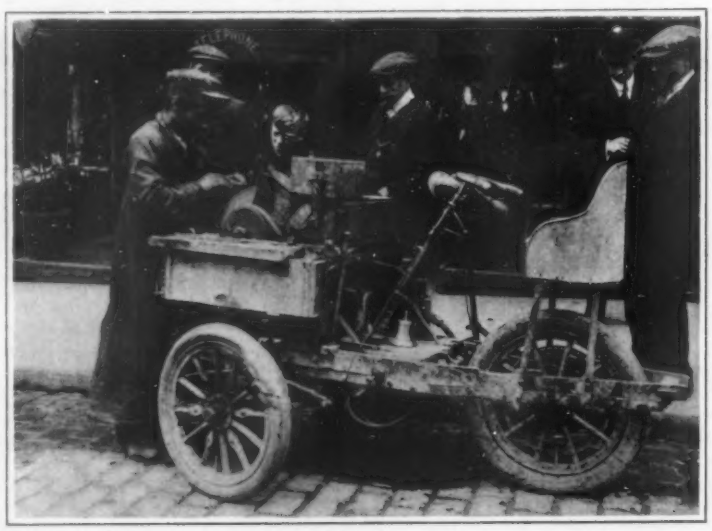
Devastation upon the Railroad Caused by the Breaking of the Austin Dam

THE accompanying photograph gives an excellent idea of the tremendous power in a stream of water that is suddenly released, as was the case when the dam broke at Austin, Pa. recently. In the path of the onrushing water were located the yards and railway shops. One would scarcely believe that so substantial and heavy a piece of machinery as a freight locomotive could be completely demolished by the water, yet the photograph shows two of these engines almost as badly damaged as they would have been in a collision or by the bursting of their boilers. In the foreground appears the truck of a freight car. The car itself was undoubtedly carried far down stream with the onrushing current. The tracks of the railroad were twisted and bent, in one instance even into a complete circle.

Locomotives wrecked as the result of the breaking of the Austin dam.

An Automobile Scissors Grinder

AN ingenious French mechanic is shown at work in the accompanying illustration, sharpening a pair of shears. With a small gasoline motor three wheels, a pair of springs, etc., he has built himself a novel tricar with which he can quickly go from place to place and drum up trade. A similar vehicle can be seen about the streets of New York, but the American scissors grinder has only progressed to the point of using a gasoline motor to run his grindstone, both the latter and the motor being mounted in a horse-drawn wagon. The Frenchman has the advantage of not having a horse to feed, and as long as he is a mechanic, he has no difficulty in keeping his novel tricar in repair.



A self-propelled scissors grinder.

Veterinary Use of X-Ray Photography

FOR several years Roentgen-rays have been used successfully by the medical profession as a means of determining the nature of a broken bone, thus facilitating the setting of it and the location of foreign bodies such as bullets in the human body. But, never before to our immediate knowledge has this branch of science been used to aid the veterinarian in the examination of a horse.

Taking an X-ray photograph of a horse's injured leg.

The owner of a stock farm, near Lexington, Kentucky, has a very valuable young horse which was injured about three inches above the pastern on the left hind leg. The surgeon in charge thought that probably a nail or other foreign body was broken off in the injured part. The horse was brought to Prof. M. L. Pence, of the State University of Kansas. Wires from the coil were passed out of the window of the Physics Building and connected to the Roentgen-ray tube which was held in a clamp stand.

The horse's right hind leg was held up as if being shod, while the tube was placed about sixteen inches from the part to be photographed. The sensitized plate was held as near the leg as possible on the opposite side from the tube and the exposure made. Two such exposures of different lengths were made, the one of ten seconds giving excellent results. A Roentgen-ray picture of the hand may be made with this coil by an exposure of two or three seconds. With a coil requiring several minutes to make an exposure, it would in all probability be difficult to get a horse to refrain from moving long enough to obtain the exposure.

The interrupterless coil used is an extraordinarily fine one of German make, this being the first university in the United States to have one of this type. It is admirably suited for many other experiments in the physical laboratory.

The Exploration of the Brahmaputra

IN his presidential address before the Royal Geographical Society last May, Major Leonard Darwin named three fields in which the explorer may yet hope to win renown by robbing the unknown of its romance—the South Pole, the interior of Arabia, and the bend of the Brahmaputra.

The reasons why the siege of the South Pole has been so painfully protracted are sufficiently obvious; a glance at the map of Arabia shows a blank space of formidable dimensions, which, even if the country were less inhospitable and its inhabitants less hostile, might keep explorers busy for many a year; but the unknown stretch of the Brahmaputra, just north of the British frontier in Tibet, is so insignificant in extent that only the largest-scale maps of the present day distinguish it with dotted lines. The length of this portion, to which no European and no native surveyor under the Indian government has yet been able to gain access, is actually much less than one hundred miles.

Much of the surrounding country has been explored, and the general trend of the land is so well known that the identity of the Brahmaputra of Assam with the Tsangpo of Tibet is absolutely unquestionable. Yet even the attempts to obtain direct evidence of their identity by floating marked logs from the upper river, have hitherto proved unsuccessful.

There are two reasons why the many efforts heretofore made to unlock the mystery of the river have failed; first the extraordinary roughness of the country, and second the savage hostility of the Abors, the tribe through whose country the river runs. It is known that there is an enormous difference of level between the two known portions of the river. In a stretch of 130 miles the fall amounts to 10,000 feet; hence the descriptions emanating from Tibetan sources of stupendous gorges, falls, and rapids are quite credible.

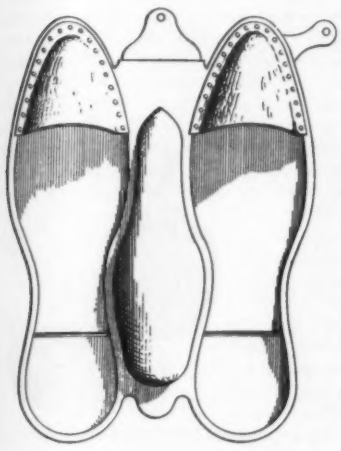
The savage character of the natives was manifested a few months ago, when the latest attempt to ascend the river resulted in the massacre of Mr. Noel Williamson, assistant political officer at Sadiya, his companion, Dr. Gregorson, and a party of 200 men.

The Funny Side of Invention

"Patentable Utility" as Illustrated in Some Issued Patents

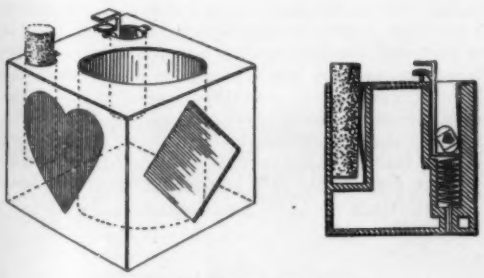
By Laurence J. Gallagher

THE labor involved in the examination of applications for patents is great, but there are certain circumstances connected with it which render it pleasant. The examiner is not only abreast of the times in his art but he is in advance of it in many instances because the Patent Office generally learns of inventions and discoveries before the world at large. Apart from the consideration of theories which are advanced in support of new inventions, the examiner also has to meet and successfully refute those theories which have no foundation or which are clearly due to the efforts of the applicant to obtain a patent. The patent law requires that an invention have utility and it is in setting forth the utility and in explaining it that many applicants go astray. This is especially true of the applicant who is prosecuting his own case and who, very generally, is ignorant of the technical requirements. Some applicants in the electrical art can see benefits in the use of their device which never occurred to others; they are enthusiastic over their discoveries and their elemental knowledge is supplemented in certain cases by imagination. Many of these applicants believe that the examiner cannot understand their inventions when the utility is questioned by him and the applicant is called upon for further information.



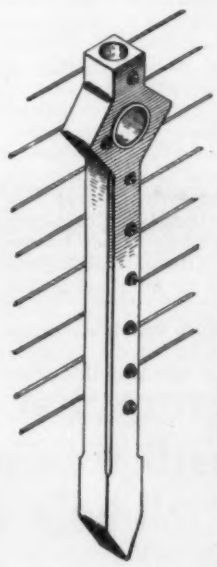
Wooden sewing-machine treadles.

One inventor proposed to make a magnetic belt of a number of batteries adapted to encircle the body, the belt also containing a number of permanent magnets placed adjacent to the end cells of the batteries so that "each cell would be a pole"; it was also proposed to provide a vacuum in the belt, "this vacuum or hiatus to be filled with acid." The purpose of the belt was to furnish magnetic currents to the body, "all the electric currents of the batteries being converted into magnetism." The number of cells in each battery could be varied at will since "the greater the number of batteries used the greater would be the magnetism until sufficient batteries were added to produce magnetic stress." The terminals of each battery were to be in contact with the skin, the magnetic currents flowing through the body, the operation being described as follows: "When the belt is applied to the body, magnetism is produced by detached currents of electricity which are alternated and induced through the body according to the laws of inductive diffusion and reflex action. This passing of current through the body in this manner produces a sedative and tonic effect; the more the batteries are used the greater will be the magnetic potency and polarity." The particular function of the "vacuum or hiatus filled with acid" was "to break up the currents that would tend to run around the belt, thereby assisting in forming alternating currents, the alternating currents being held in suspension by magnetic force, the crossing of the alternating currents producing minor magnetic centers in the body, the induced currents produced by the magnets assisting the alternating currents in producing magneto-electric currents."



The indispensable tally block.

The name magnetic belt was objected to by the examiner who suggested that electric belt would be a proper term; the inventor replied to this as follows: "If my magnetic belt makes more magnetism than electricity, then it is a magnetic belt and is rightly named; if four or more of my batteries in my belt do not make an excess of magnetism then it makes nothing; electricity makes magnetism and cannot live without it. Magnetism is a mode of permanent electric force, and it differs from the other modes of electric force in that the energy it excites in a body is always present, especially at the extremities; the extremities of a magnet are called poles, and the properties they exhibit are termed polarity; polarity increases magnetic force; the more poles the more magnetism. When four electric currents are properly arranged in my belt the ceaseless flow of interchangeable inductive alternating currents become supreme in magnetic force and potency. One battery alone in my case makes a direct electric current; but four or a dozen batteries, four or a dozen currents, four or a dozen magnetic fields, detached, having broken currents, and when within an electrical radius of one another, producing induction and an amalgamation of mixed currents which are magnetic by an overcharge of magnetic poles, electric currents, and magnetic fields. An electric current is a stimulant and an exciter and dangerous in cases of fever and heart disease; a magnetic current is sedative and safe in the above cases; this I have experienced in treating patients and this is another reason why my belt is not an electric belt; but a magnetic belt is the same as an electro-magnetic belt, and is better understood; magnetism and electricity go together in some proportion anyway, and magneto-electric would suit no better than my original name of "Magnetic Belt." The inventor probably became muddled as he proceeded in his argument which accounts for the statement that "magnetism and electricity go together in some proportion anyway."

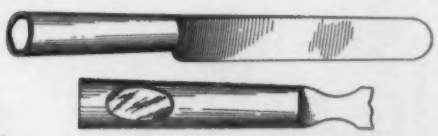


Fence-post nest.

Another invention had for its object the diminishing of sickness and death among women and girls who operate sewing machines. The inventors in this case had spent twenty-five years investigating the physical and mental laws of health-culture and life forces, the causes of diseased humanity, and the remedies, and for ten years had been observing the many evils resulting from operating on sewing machines. During that space of time they did not find one case where the health of the operator remained good, and where the functions of the body were undisturbed after operating a sewing-machine for a short time; in the words of the inventors, "six months generally developed alarming symptoms." While admitting that sewing machines must and will be used, "we positively assert that girls and woman are sacrificed in this way"; the discovery which led to the invention was "that the electric forces of the system, in connection with the iron treadle and steel plate, are the ever-growing source of trouble in operating sewing machines." From many experiments the inventors explained the source of trouble as follows: "It is the electric current created by the friction, and the feet of the operator in contact with the iron treadle, and the hands with the steel plate. The treadle of the old spinning-wheel was wood; consequently there was no waste, and no cold feet. The wooden sandal naturally becomes warm from the system, and it being porous, and an element conducive to nature, it will assist the forces of the body and the friction produced does no harm. We have operated sufficiently to report from experience, and we know it is not the physical force needed to run the machine which leads to the alarming symptoms; neither is it the motion, as the motion under proper conditions would be beneficial. We consider rubber just as objectionable as iron and have seen many cases of disease from rubber coming in contact with the physical system."

The invention consisted in making the sandals which were connected to the treadle of the machine of wood, the feet being positioned in the sandals by means of leather straps, together with a wooden plate on the top of the machine and adjacent the needle and on which the operator's hands would rest while running the machine. This case is a good example of an exception to the rule that mere change of material does not amount to invention, since the humanitarian object of the invention and the untold benefits which would follow its use carried dignity.

Another inventor devised an attachment for telephones and submitted a description which was not clear to the examiner; upon being asked for further description the inventor replied as follows: "This instrument will work the minute central inserts the plug and therefore it enables a person to come to the 'phone before the same rings."



Mirrors in fork and knife handles.

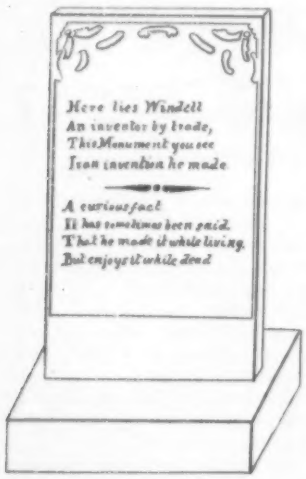
Persons with excessive abdominal weight may reduce the same if they will make use of a device which exhibits much ingenuity in its manner of use; the corpulent one has himself strapped to a frame which extends down his back, there being a handle attached to the frame. He then lies down with his face to the floor and the frame and himself are rocked back and forth, the protruding mass of adipose forming an excellent fulcrum. The production and use of such an invention is a boon to humanity; the person of excessive weight may bring himself to size adapted to fit into the ordinary chair while those about him can use the space to which they feel entitled.

The prevention of collisions between railroad trains has offered and still offers a fruitful field for inventions. Whenever a person of prominence or authority travels over a railroad it is the general practice to have a pilot train precede the one in which he is riding; of course this is a departure from the general run of things and how to accomplish the same degree of safety with less trouble has prompted many ingenious minds. One patentee discloses a novel method, the invention involving the use of a pilot having telescoping members connecting it with the front of the locomotive. In the event of a train coming in the opposite direction on the same track the pilot will collide with the other train or with a similar pilot connected thereto, the result being that the telescoping connecting members slide into each other, such movement resulting in closing the throttles and setting the brakes. The utility of the pilot is increased by providing a bell thereon together with an automaton for striking it; while the pilot is mechanical in its operation it is fitted with electrical devices which are actuated thereby which justifies the title "electric pilot."

A good part of invention is directed to small articles which may serve a variety of uses; these articles of manufacture are gotten up to sell at a small price and it is difficult to classify them. In most instances nothing just like them has ever been produced and the applications for patent are based in many cases on the purposes which the inventors intend to be served by the devices. A man devised a tally block and submitted an application for a patent; the block was in the form of a hollow cube, one side being provided with an opening for holding a piece of chalk or a pencil in order to keep count in a game of cards; the suits of a deck of cards were indicated on four of the sides, the block being turned into position to indicate the trump; one side was provided with a pocket which could perform

Picture frame for tombstones.

a variety of functions; another side was fitted with a movable index and a series of numbers in order to facilitate keeping the score. While the block was intended primarily for use in a game of cards the inventor set forth in his specification a multitude of uses as follows: "Besides the above mentioned convenience to a card player who uses my tally block for which I pray to obtain a patent, I claim it to become a constant companion to present humanity and countless millions to come. The man of business will carry it in his coat pocket and rejoice to be in position to meet any emergency; a hole in his pocket does not bother him as he can carry his loose change in the tally block; the sponge in the pocket can be changed at will and can contain the perfume which will permeate his clothes. Walking about the street his nose is apt to offer a good landing place for particles of soot; the little mirror of the tally block will keep him from looking at it x-eyed and spitting on his handkerchief; the sponge will perform that duty. No fear of footpads, as a corner of the tally-block on the top of his head, with a gentle pressure, will make quite an impression. Coming home, baby cutting teeth and cross, will change into a smiling miracle when papa pulls out the tally block and juggles with it, its attention being riveted the pain is gone. Coming home late from lodge meeting, and the key being about one inch out of his reach on the transom, the tally-block is as good as a step-ladder. In case wifey thinks she heard a noise in the cellar, or wants him to look at the gas meter, the tally block answers the purpose of a candle holder. It is a handy receptacle for studs, buttons, pins and chewing-gum. To a poet with inspiration or those who want to keep record of a dream and write in the dark, nothing takes the place of the tally-block. In shaving the mirror can be placed at proper height; the window in a street car can be raised a little to let in fresh air by using the block as a rest. Instead of applying the tongue to moisten the backside of a postage stamp, the sponge will do it without the fingers coming in contact with it. No crowding in a street car, as a block in your side coat pocket makes it uncomfortable for your neighbor to sit on it. The fisherman no longer bends himself into an undignified position to quench his thirst, and the cart driver has something to block a wheel." Anybody can elevate himself by standing on the block to get a peep at a passing procession. It can be used as a pen-wiper, as a paper weight, as a receptacle for pens; a book can be placed therewith in the proper angle for reading when so desired and pages turned by dampening the fingers with the sponge.



A poet's invention.

"It can be put to use to measure with by having a measure marked on the side of the block or by knowing the size of the block and turning it a required number of times. The house-wife will use it, saturating the sponge with turpentine and pack it away with the clothes to keep the moths out of them, or will use it as a block to darn stockings on. The orator will place it before himself on which to mark his subject-matter and turn the block as he progresses in his speech. The lawyer uses it in his speech to the jury to illustrate on what side of the house the murder was committed. The reporter uses it when he is short of paper, and the undertaker when he finds that the head of the corpse has not the proper elevation. As a novelty, my tally-block contains a dictionary full of them. The foregoing uses of my invention, I mainly draw attention to in order to show its varied practical utility."

Some inventors can see the "beautiful" in their devices along with certain other advantages as the following will show: a man invented a concrete fence-post especially adapted for use on farms, the object of his invention and the accomplishment thereof being set forth as follows: "The object of the invention is to provide a fence-post which in addition to its usual function of protecting the farmer's fields against trespassing animals, also protects said fields by encouraging the little birds to come to the fields and destroy various forms of insect life that are injurious to the husbandman's trees, fruits and crops. I accomplish the foregoing object and the further object of gaining for the toilers on treeless fields the inspiring, uplifting and encouraging companionship of the singing 'angels of the air,' by providing a fence-post which serves as a harbor, refuge, home and drinking fountain for a family of birds. The fence-posts studding the boundaries of a field in large numbers will, accordingly, furnish a large number of homes for the birds and in a large measure take the place of boundary trees used as fence-posts as harboring places for birds." The fence-post was provided with a drinking cup which would receive some water during rainstorms; the post was also provided with a large opening which was lined with a water-proof material to serve as a nest.

There is not much relation ordinarily between a table knife and a mirror, yet a mirror may be appreciated under some circumstances as the following will show: "This invention relates to certain new and useful improvements in mirrors for table implements, and the object of the invention is to provide a table implement with a mirror suitably secured in the handle, so that the user of the implement may have ready at hand a mirror for the purpose of inspecting the teeth in the mouth or the mouth or other portions of the face generally at any time desired. The invention is particularly designed for use in connection with table implements such as are used in restaurants, cafes, or other public eating establishments. Oftentimes a patron of a restaurant finds the need of a mirror to discover a substance which has become lodged in the teeth, or for the purpose of determining whether the lips be entirely clean after eating certain foods. It is not only inconvenient, but embarrassing oftentimes as well, for such patron to ask for a mirror to be used at the table. In my device, however, the mirror being in the implement used by the patron during eating, may be used by him or her for the purpose indicated substantially without attracting any attention and is always ready for such use at any time desired."

An inventor is always obliged to submit a sheet of drawings illustrating his invention, if the invention permits illustration; some arts, especially that relating to tomb-stones, offers an opportunity to the inventor to set forth his thoughts. One inventor, who was something of a poet as well, set forth the following inscription:

"Here lies Windell,
An inventor by trade,
This monument you see
Is an invention he made;
A curious fact,
It has sometimes been said,
That he made it while living,
But enjoys it while dead."

Another inventor devised a picture frame to be placed on a monument which was to contain a photograph of the deceased; the frame had a movable cover on which was the following: "Look at me then cover my face."

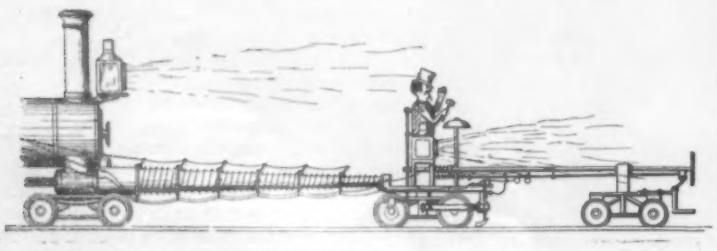
Another very practical device was a chewing gum locket; the inventor's object in setting forth his construction to the world was, "to provide a locket of novel form and construction for holding with safety, cleanliness, and convenience for use, chewing-gum, and which may be carried in the pocket or otherwise attached to the person, the improvement consisting in the provision of an anti-corrosive lining" in the locket. Such an invention was undoubtedly of great value to chorus girls since it offered a ready means of cutting down one item of expense.

When an examiner picks up a new case for examination he never can tell what the examination is going to bring forth; each case involves the application of an idea which the applicant believes to be new; the idea may be impractical or may have the highest degree of utility and it is this determination, which in some cases amounts to uncertainty, that lends attractiveness to the work. Claims to an invention may be rejected by an Examiner upon proper references, which may be former patents or publications of any sort. The citation of some references is very often objected to by an applicant who holds that the reference does not disclose the invention he claims. An applicant for a patent on a concrete chimney replied as follows to a rejection, the applicant probably being correct without really knowing it: "Solomon said, there is nothing new under the sun; consequently it is only a combination of old things that gets patented." In another case the inventor delivered himself of the following: "No one can tell what is the nature of the bars shown in the patent, and anticipation is not to be deduced from such nebulous disclosures; the prophet Nahum (Nahum 2:4) said, 'The chariots shall race in the streets, they shall jostle one another in the broad ways; they shall seem like torches, they shall run like the lightnings.' and some Patent Office *attachés* might be found to contend that the modern motor car was anticipated thus, and, while this Examiner would doubtless appreciate the error of their ways, it is almost as far fetched an anticipation as the one ironically cited above." Some applicants amend their cases hurriedly and follow out the suggestions of the examiner without consideration of the point raised; in one case an examiner believed that a specification could be improved and he wrote the applicant as follows: "Page 2 of the Specification, line 3, 'slotted' should be deleted;" the applicant replied, "Page 2, line 3, cancel 'slotted' and insert 'deleted' in lieu thereof."

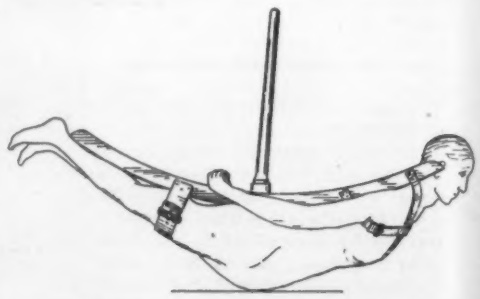
Chewing gum locket.

A Hot Summer in Europe

LAST July was the beginning of a period of excessive heat over western Europe. The Weekly Weather Reports of the British Meteorological Office, after the first week of the month, noted "unusual" or "very unusual" warmth in nearly all sections of the British Isles. The latter notation predominated, and this means that the excess of temperature was such as does not occur more often, in the long run, than once in twelve years. More significant than the readings of the thermometer was the unprecedented fact that members of Parliament discarded their coats and transacted weighty business of state in their shirt-sleeves. In London, the month was the warmest July for at least forty years past. In France, a remarkable period of unbroken sunshine prevailed, accompanied by excessive heat. It is stated that not a single cloud was seen at Paris from July 2nd to July 24th. A maximum temperature of 102.2 (Fahrenheit) was recorded at Rouen on the 22nd. The hot weather continued, with but slight interruptions, up to the middle of September. On August 9th a maximum temperature of 100 deg. F. was recorded at Greenwich Observatory—the highest ever observed at that institution. The heat was accompanied by drought, a water famine being experienced in many parts of England, where from July 1st to September 12th the rainfall (as measured at Greenwich) was but 30 per cent of the normal. The *Lancet*, discussing this unusual weather, finds that it was a serious factor in the recent strikes, so irritating was it to the temper of the people. From the Alps come reports of dangerous avalanches caused by the melting snow and ice. It is said that ice centuries old and probably never before seen by man was exposed to view under the burning sun. Small glaciers disappeared and large ones shrunk. Although complete discussions based on accurate observations are not yet available, it appears certain that the summer of 1911 will go down in history as one of the most remarkable in the records of meteorology.



The "electric pilot" will prevent collisions.



Rocker for reducing abdominal weight.

We advise you to accept the first delivery of a Cadillac which your dealer can give you

Please credit your Cadillac dealer with sincerity when he warns you not to lose your "place in line."

Many Cadillac dealers have reported sales of the entire number of cars which have been allotted to them for the 1912 season. Others have only a limited number yet to sell.

Your dealer may be confronting a similar situation.

At any rate, nothing he can tell you concerning the conditions in your own city can begin to do justice to the profound impression created throughout the world by the new Cadillac.

Prior to this year, the public has rightly looked upon the principle of automatic starting and lighting as speculative and theoretical.

But this same public remembered, when it learned of the perfection of the Cadillac system, that the Cadillac Company had never promised what it could not perform.

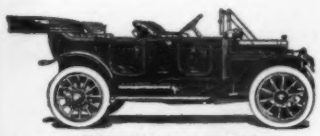
Indifference immediately gave way to eagerness, interest and enthusiasm.

The mere advance rumor that the Cadillac Company was about to announce its achievement made such an appeal to the public that the paramount problem confronting other cars is that which has ceased to be a problem in the Cadillac.

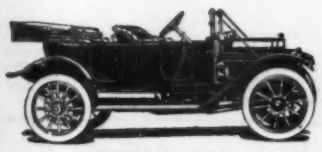
No one, now, is wasting any time or thought in debating the question as to whether the Cadillac electrical system is the correct and dependable system of starting and lighting.

Three thousand of the new cars, revealing the luxury of the Delco system, are stimulating the normal Cadillac demand to such an extraordinary extent that we advise you, again, to accept the first delivery your dealer can give you.

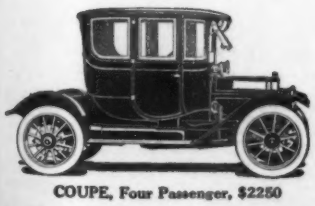
You who have not grasped their full significance—stop and consider these new comforts created by the Cadillac Electrical System



TOURING CAR, $1800



PHAETON, $1800



COUPE, Four Passenger, $2250

It has no crank.
Its "cranking" is done by an electric motor.

It has no gas nor oil lamps.
It makes its own electric light.

It has two complete systems of ignition, either of which is efficient for operating the car independently of the other.

But, best of all,—the three functions, starting, lighting and igniting, are all performed by one compact system, a system which is not obtainable, either in whole or in part, on any other car.

The dynamo charges a storage battery.

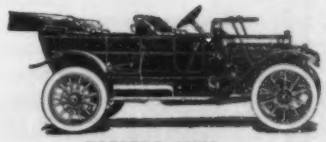
The dynamo is temporarily transformed into a motor and, acting as a motor, it automatically starts the engine.

Then—it reverts again to a dynamo and generates current for lighting and for ignition.

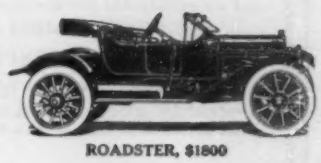
You—press a button and push forward the clutch pedal. The engine starts.

Nothing for you to think of—except the luxury of no cranking. Reliable as the motors which drive the trolley cars.

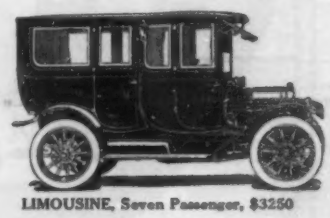
Nothing for you to think of—except the luxury of no lamps to light; and the brilliant, steady glow of electric lights instead. Reliable as the electric lights which illuminate your home.



TORPEDO, $1900



ROADSTER, $1800



LIMOUSINE, Seven Passenger, $3250

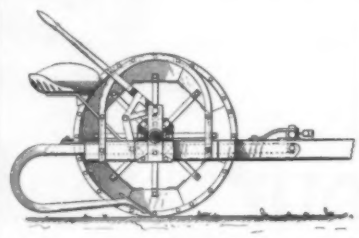
CADILLAC MOTOR CAR CO. - - - - DETROIT, MICH.

RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Of Interest to Farmers.

POTATO DIGGER.—CLAYTON W. FORD, care of William St. Dairy, Findlay, Ohio. This invention is an improvement in potato diggers, and is illustrated with a section view of the apparatus. In operation the digger is drawn through the field, with a blade or plow a sufficient depth to pass below the potatoes, and



POTATO DIGGER.

as it moves along the potatoes are lifted from the ground. During transportation, the plow may be lifted out of the ground, and by means of the lever it may be held at any desired depth. The arrangement of the beam of the plow moving between the frame sections prevents any lateral swinging movement of the said beam with respect to the frame, so that the plow is held directly in the row. The width of the felly of the wheel is greater than that of the rings.

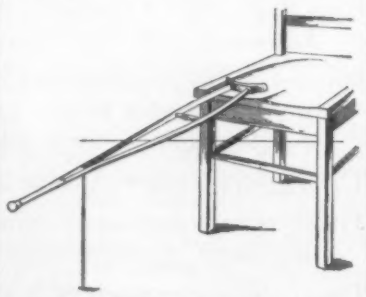
ALARM ACTUATING MECHANISM FOR INCUBATORS.—W. M. BRALY, Blackwell, Okla. This mechanism is certain in operation and will not be damaged by the increase or decrease of temperature beyond the points where it has been adjusted to operate. The contact lever is pivoted to a rod mounted to travel in guides, a spring being provided to hold the rod in a predetermined position, the contact rod being connected with a thermostat by which it is operated. As the lever is operated by the thermostat it contacts with electrodes, to complete an electric circuit in which there is an electro-magnet.

GIN SAW CLEANER.—H. J. FITZPATRICK, 153 Nellie B. Avenue, Athens, Ga. The invention refers to cotton gins, and its object is to provide a new and improved cleaner, arranged to permit the operator to throw the cleaner into action while the gin is running, with a view to insure complete and quick removal of any lint or extraneous matter that may adhere to the saws.

Of General Interest.

EXERCISING DEVICE.—E. D. ANGELL, 3600 Minn Avenue, Corvallis, Ore. This exercising device comprises an elongated bag, of canvas or leather or other suitable material filled with sand or other suitable substance to give it weight without rendering the same inflexible. While it may be preferred to make the device flexible, the body portion may be made inflexible as for instance, out of wood or metal with the straps.

CRUTCH SUPPORTING ATTACHMENT.—LOUIS REMICK, 261 Madison Street, Passaic, N. J. This invention provides a crutch with an attachment which may serve as a support for the crutch when extended in a horizontal position, and provides an attachment in a manner to avoid the same becoming an obstruction to interfere with the comfort of the user when the crutch is employed in the usual manner.



CRUTCH SUPPORTING ATTACHMENT.

The invention consists is adding a swinging strut or arm to the crutch which, when extended perpendicularly from the crutch, is locked into position to form a rest for the crutch when the same is extended in a horizontal position. Means are provided for adjusting the length of the strut to equalize or to compensate for a seat or other place of rest of the user. A perspective view of the invention is shown in the engraving.

GARBAGE INCINERATOR.—J. B. HARRIS, 210 Stahlman Bldg., Nashville, Tenn. The invention provides a smokeless and odorless incinerator, more especially for use of municipalities, large manufacturing companies, etc., to permit convenient charging of the furnace with garbage or other refuse and separation

INQUIRY COLUMN

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Inquiry No. 9254.—Wanted, the name and address of manufacturers of lead pencils and pen holders, such as are used for printing advertisements on.

Inquiry No. 9255.—Wanted, to buy a patent roller, a ball-bearing axle, which could be purchased on a royalty basis; it must be cheap and fully proved.

Inquiry No. 9256.—Wanted addresses of parties having Pitchblende deposits, if able to ship ore.

Inquiry No. 9257.—Wanted addresses of firms selling second-hand water turbines.

Inquiry No. 9258.—Wanted addresses of parties having gem materials to offer in any part of the world.

Inquiry No. 9259.—Wanted to buy a machine for removing the coating of a filbert.

Inquiry No. 9260.—Want addresses of parties able to ship corundum, garnet, flint, emery or any material suitable as anabrasive.

and reduction of the liquid and solid matter, to insure complete combustion of matter and utilizing products of combustion for heating boilers for generating steam to be used partly in the furnace, and a surplus for power purposes for the production of electric lighting, etc.

PYROPHORIC METAL ALLOY.—G. F. HOFMANN, Bayerstrasse 57, Munich, Bavaria, Germany. In accordance with this invention the pyrophoric metallic alloy of manganese and antimony has only added to it a small quantity of metallic cerium, for instance, about 5 per cent of metallic cerium suffices to considerably reduce the hardness of the manganese-antimony without injuring its pyrophoric property. It sparks better than the simple antimony and manganese alloy, it is more easily filed and remains unaltered in the air.

FOLDING TOOTH BRUSH.—S. B. LJUTICA, 400 Columbia Bldg., Portland, Ore. This invention relates to tooth brushes, and it has for its purpose one which may be folded and carried in the pocket, the device having a box for containing tooth powder, which is permitted to reach the brush member, pivoted to the box through an opening therein.

BAIT FOR CATCHING ANIMALS AND THE LIKE.—C. H. FREYER, Laddonia, Mo. In the use of this composition, the same can be used in connection with any common animal bait, such as meat and the like, or the composition can be used alone. When used in conjunction with animal traps, it serves to attract the animal to the trap and in this manner presents an efficient and easily prepared bait.

Hardware and Tools.

WRENCH.—A. BERAN, Kopprasch Agent, Vienna, Austria-Hungary. Use is made of a handle provided with a jaw extending at an angle from the handle, and having thereon a gripping lug for engagement with the peripheral surface of an object to be turned or adjusted, and a second jaw provided with a gripping lug for engagement with the peripheral surface of the object, the said second jaw being pivotally mounted on the handle and in contact with a spring mounted on the handle.

DESK REMINDER.—G. W. WRIGHT, Scheuer Bldg., 738 Broad Street, Newark, N. J. An object of this inventor is to provide a device which will hold a plurality of memorandum tabs in separate readily accessible positions, whereby they can not only be readily removed and inserted, but also can be at least partially visible, so as to be distinguishable one from the other.

WRENCH.—EDWARD L. BROWN, Box 39 Virginia City, Nev. This engraving presents a side view partly in section, of a wrench showing the jaws open. The handle may be preferably of metal channeled out in its sides. The tapered forms of jaws are useful in that they will hold the end of the wrench on the pipe after the jaws are adjusted and there is no danger of their slipping off. The sliding jaws may be adjusted to fit upon a pipe by turning the screw, and the last may be slacked to allow play between the jaws so the wrench will work freely around the pipe, and if very thin the throw of the sliding jaw can be regulated so as not to crush the pipe. The inventor will communicate with reliable parties on request in relation to manufacturing the wrench on a royalty basis.

PIPE-WRENCH.

Heating and Lighting.

WARM AIR REGULATING HEARTH.—E. B. LOBACH, 4715 Haywood Place, Denver, Colo. In this structure the inlet opening for warm air is adjacent the bottom of the hearth and is covered by a plate which has a portion of its surface perforated to permit passage of the warm air from the inlet pipe through the hearth into the room or apartment. The perforated portion is controlled by a slide or damper which uncovers a greater or less number of the perforations as desired.

FLEXIBLE PIPE COUPLING.—W. A. CRAMMOND, 337 E. 19th Street, New York, N. Y. The invention relates to improvements in pipe couplings for use generally in connecting relatively—movable pipes through which a fluid is delivered, the special form of coupling being designed for use in connecting steam pipes, which carry the steam to multiple waterseal cups of telescopic gas holders, to prevent the freezing of the water within the cups during winter.

Household Utilities.

BATH ACCESSORY.—F. HESS, 511 Fifth Avenue, West, Kalispell, Mont. This invention provides a sanitary towel supporting frame to be readily adjusted to a bathtub of usual construction, the frame being provided with means for securing the towel firmly in the frame; and provides a device adapted for attachment to the inclined end of the bathtub.

SINK FRAME BRACKET.—W. J. DALY, 314

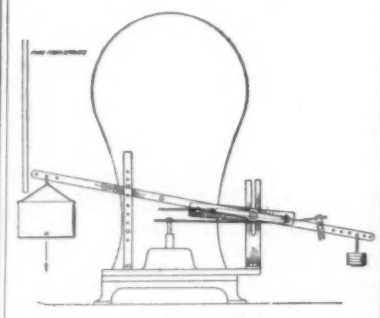
N. Main Street, Mason City, Iowa. This invention is an improvement in sink frame brackets, and the aim is to provide a bracket which is especially adapted for supporting sinks, and which may be expanded or contracted, to fit sink frames of varying sizes, and wherein means is provided for locking the parts in adjusting position.

WATER CLOSET FIXTURE.—T. F. WARD, care of T. J. RYAN, 6 Howard Street, New York, N. Y. In the present invention the principal object is the provision of a fixture for the usual water-closet bowl, which automatically closes over the bowl to prevent the emission therefrom of disagreeable odors or sewer gas, and to conceal the interior of the bowl.

Machines and Mechanical Devices.

ATTACHMENT FOR SHUTTLES.—G. PAVIA, Allentown, Pa. This attachment severs the thread so as to prevent damage, when an unusual pull is had on the thread. The attachment may be secured to shuttles in ordinary use, which may be set so as to allow the thread to feed from the bobbin just so long as the loom is working properly, but when, from any cause an unusual pull is had on the thread or a knot or tangle in the thread reaches the attachment, the thread will be automatically severed so that the shuttle will run free.

AUTOMATIC RAM STARTER.—J. F. T. B. BRENTANO, St. Paul, Orc. The object here is the provision of means in connection with the ram for opening the impetus valve to stop and start the same in accordance with the head of the water, stopping the ram when the water falls below a predetermined point and starting it when the water has a sufficient head. The illustrated figure shown herewith represents a side view of the improvement, the ram of which is of any usual

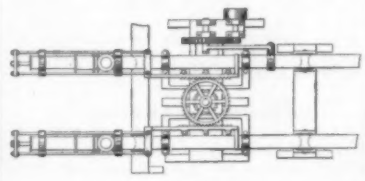


AUTOMATIC RAM STARTER.

or desired construction and the impetus valve thereof is contained in the chamber at the base of the ram.

FLYING MACHINE.—E. J. CRAWFORD, 1208 N. 45th Street, Seattle, Wash. An object of this invention is to provide a lighter-than-air machine which is provided with a safety device so as to prevent a rapid descent which might injure the aviators. This device is in the nature of a parachute which may be shifted so as to sustain the flying machine so that its descent will be gradual.

PUMP.—KARL F. GERHARD, Hatton, Wash. The principal object which the present invention has in view is the provision of a pump having mutually balanced stand pipes of indefinite length, the said stand pipes being each provided with pumping means for increasing the height of the column in each of the said



PUMP.

pipes, said means operated by the other of the said pipes, thereby reducing the power needed for reciprocating the said pipes. The accompanying illustration exhibits a plan view of the pump constructed and arranged in accordance with the present invention.

SPUDDING DEVICE FOR WELL-BORING MACHINES.—G. P. RIGGS, Box 411 St. Mary's, West Va. This invention provides a boring bit reciprocating device having an amplified stroke and mechanism for operating the same; provides means for reducing the rotation of the lifting sheave and the travel of the drill rope thereon, without diminishing the stroke thereof; and provides an extensible rigging for boring operations.

NECK GROOVING ATTACHMENT FOR BOTTLE MOLDING MACHINES.—R. JOHNS, 511 Walnut Avenue, Fairmount, W. Va. Primarily, this invention consists in providing a separate mechanism for grooving the neck of a bottle, mounted upon one or the other of the primal molding tables, to impart the groove in the glass prior to its initial hardening, thereby avoiding reheating.

AEROPLANE.—C. M. WANZER, Urbana, Ohio. This inventor provides a construction

whereby aeroplanes are enabled to start their flight from a resting position; provides means for mechanically lifting the aeroplane to an inclined position while in contact with the ground or starting station and provides manually operated mechanical means for initiating the flight of an aeroplane.

DRILLING MACHINE.—K. L. J. FRAZER, Sandpoint, Idaho. The aim in this case is to provide a machine more particularly adapted for drilling holes in tree stumps and the like, preparatory to blasting the same. Further, to provide a machine mounted to swing on a frame, so that the drill can be used at various angles and positions, depending wholly upon the work to be drilled.

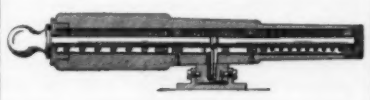
Railways and Their Accessories.

SELECTIVE SWITCH MECHANISM.—A. V. MCPARTLAND, 16 Ferry Street, Newark, N. J. This invention has reference to a device whereby the motorman on a car as he approaches a switch leading to a plurality of different tracks, can operate a mechanism on the car which actuates the switch so as to divert the car in the direction in which he desires to go.

SAFETY APPLIANCE FOR AIR BRAKES.—A. B. LEFTWICH and C. N. MARKLE, 1413 E. 7th Street, Pueblo, Colo. The object here is to produce a brake which is simple in construction and which can be controlled in its operation by pneumatic means, a more specific purpose being to provide mechanism whereby a brake is held unapplied by pneumatic and mechanical means, and is applied by spring pressure when pressure in the service or train pipe is sufficiently reduced.

Pertaining to Recreation.

GUN.—AUGUST REIBSTEIN, 48 Stuyvesant Street, New York, N. Y. The purpose of this invention is to provide a new and improved gun, arranged to permit of conveniently turning the barrel of the gun in a horizontal plane for taking the desired aim, and to permit the



GUN.

user to readily propel and retract a striking or a shooting plunger without danger of disturbing the aim. For the purpose mentioned, use is made of a barrel containing two spring-pressed plungers, of which one on being released actuates the other plunger. The engraving herewith gives a view of the longitudinal central sections of the gun.

TOY.—T. D. FLOTO, Box 17 Station S., Brooklyn, New York, N. Y. This invention relates to toys having a ball or roller adapted to wind up and unwind on a cord held at one end by the user of the toy. The object is to provide a toy in which the ball is rendered exceedingly smooth, and the necessary weight is provided to insure a proper unwinding of the ball and re-winding on the cord by the momentum caused by the unwinding of the ball.

Pertaining to Vehicles.

VEHICLE TIRE.—F. A. SCHULTZ, care of Mattson Rubber Co., Lodi, N. J. Among the principal objects the inventor has in view are: to provide a resilient filler wherein the air contained in the tire is circulated to prevent local overheating of the tire casing and filler; to provide auxiliary resilient members adapted to augment the carrying capacity of the tire and the resilient quality thereof; to provide a filler for an automobile tire formed from a number of removable and renewable sections, rendering the tire capable of economical and simple repairs; and to provide means to release or imprison the locking members of the tire, and to augment its resiliency.

AUTOMATIC CRANKING MECHANISM.—J. P. PETIT, 673 N. Commercial Street, Salem, Ore. The improvement is in cranking mechanism or devices used on automobiles, and the aim is to provide a novel construction whereby the engine can be cranked from the driver's seat of the car in a perfectly safe manner, and by means which will avoid the possibility of any injury to the driver by the action of the engine.

ROAD MACHINE.—M. M. SICKLER, Pala, San Diego Co., Cal. This invention provides a scraping blade and supporting frame connected directly with the draft team or mechanism; provides carrying wheels and means for varying their angle of operation; provides for the carrying wheels a supporting table the operation whereof serves to vary the lift of the body by adjustment of the said wheels; provides carrying wheels and mechanism therefor whereby the same may be turned to vary the angle of a scraping blade; and provides carrying wheels and body structure adapting the machine to be turned upon a self-contained center.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Needed Reforms in Patent Procedure

(*Concluded from page 446.*)

or seventy-five dollars a day for their services in preparation and while testifying, it can readily be seen how enormous the expenses of patent litigation may become under this mode of producing evidence. The system places the poor inventor at the mercy of his rich adversary and, sad to relate, renders it possible for lawyers with easy consciences to protract examinations for the mere purpose of multiplying *per diem* charges.

The impression should not be gained, however, that this system of producing evidence is peculiar to patent cases. It extends to all causes brought on the equity side of the court, but its evils are perhaps not so frequently manifested in other classes of cases. There is a universal cry for a remedy. President Taft in his messages to Congress has referred to it. Three members of the Supreme Court of the United States, namely, Chief Justice White, Mr. Justice Lurton and Mr. Justice Van Devanter, have been assigned to look into the matter and have conferred with committees appointed from the bars of the various Circuit Courts of Appeal with the view to ascertaining if something cannot be done by way of curing the evil. No definite result has yet been reached, but it is the expectation of the bar that, at an early day, the General Equity Rules will be so modified by the Supreme Court, under the power given that court by the statute, as to require that the testimony of all witnesses living within the jurisdiction of the trial court shall be taken in open court, in the presence of a judge, and that only the testimony of such witnesses as live beyond the reach of the process of the court (i. e., one hundred miles, or to the limits of the district) may be presented to the court by way of depositions. Such a change of practice as this may, and doubtless will, develop difficulties that will have to be met as they arise, but it is believed they will be met and that the net result will be that the volume of testimony taken will be very much reduced and that generally the dispatch of business will be facilitated and the cost of litigation very materially decreased.

Time and space will permit of an allusion to but one other need of our patent system, namely, the establishment of one great Court of Patent Appeals to which appeals from all the trial courts may go and whose judgments as to the validity of the patent in view of all defenses actually raised against it, will be final and conclusive and, in operation, coterminous with the whose territory of the United States.

At the present time, an appellate court called a United States Circuit Court of Appeals is provided in each of the nine judicial circuits, and while the judgments of this court are final, as to that circuit, they have no force beyond the limits of the latter. The result is, that a patent may, after most strenuous litigation, be held valid and infringed in one circuit, and, on substantially the same record, be held invalid and not infringed in another circuit.

Such a condition of affairs has become intolerable and for many years past Congress has been importuned to divest the Circuit Courts of Appeals of their appellate jurisdiction in patent cases and to create a new appellate court for the disposition of all patent appeals. There seems to be a general recognition of the necessity for such a court, but the difficulty of reconciling the various plans that have been suggested and advocated as to methods of organization has so far prevented a favorable outcome. President Taft, in his address to the American Bar Association last August, at Boston, made extended reference to the matter and suggested that the recently created Commerce Court, composed of circuit judges, might take over the jurisdiction of patent appeals and thus solve the problem. It remains to be seen whether his suggestion will be acted upon by Congress. The plan advocated for so many years by the American Bar Association of having a new and independent court composed of a permanent presiding judge and four associate judges selected, because of their demonstrated aptitude to deal with patent cases, from the U. S. Circuit and District benches, would seem to be more nearly ideal.

Edison's Pioneer Work

(Concluded from page 451.)

series with the armature, and could be "plugged" in and out of circuit by the motorman as he needed.

In the same year, 1880, the generators were compound-wound for better regulation under changes of load, and three cars were put in commission as rolling stock. One of these was an open car with awning, and two park benches placed back to back. Another was a flat car for freight, and the third was a box car, dubbed the "Pullman," on which Edison tried a system of electro-magnetic braking covered by patent. The road attracted a great deal of attention, was visited by celebrities, and was freely described in the papers. The SCIENTIFIC AMERICAN of June 6th, 1880, gave an excellent account of it, and a little later the New York *Daily Graphic* described also the electric locomotive with six-foot drivers, capable of working up to 300 horse-power, which Edison designed for use on the Pennsylvania Railroad between Perth Amboy and Rahway. But President Frank Thomson of the Pennsylvania could not "see it;" nor could his engineers. What would they say of the electrified Pennsylvania entrance into New York to-day?

When Edison went out to Wyoming in 1878 with his transimeter to observe and help register the transit of Venus, he had noted the long hauls of the wheat farmers with their grain. A drawing of his of May, 1879, shows electric power plants operated out on the prairies by wind power, to give these farmers light electric traction. Henry Villard had the same general idea, and in 1881, after this successful demonstration of 1880, joined issues with the young inventor and put up between $35,000 and $40,000 for a trial of the scheme. The Menlo Park pioneer line had been extended to a mile and was now made nearly three miles in length in 1882. The construction approximated standards as to gage and material and was solidly built. There were three trestles, one of which was nearly 250 feet long and 10 feet high. The rails were insulated from the sleepers by two coats of japan varnish baked on them in the oven, and by pads of tarred muslin. The ends of the rails were electroplated to give proper contact for copper bonds and fish plates. The conductors were underground as before. There were two turntables, a freight platform, three sidings and a car barn. The line ran through a rural district three miles south to Pumptown.

Two new electric locomotives were built, and following the traditional lines of conventionality there were given the full regalia of headlight, cab and cowcatcher. Little change except by way of refinement was made in the electrical arrangements from those of 1880. One locomotive was designed for passenger service and weighed five tons; the other for freight, with single reduction gears, weighed about ten tons. As many as 90 passengers at a time were hauled by the smaller locomotive in 1882. The contract speed was 60 miles an hour. The capacity of the freight locomotive per contract was 10 tons, speed negligible. Mr. Villard agreed to enter into negotiations, if the tests were successful, for an initial 50 miles of electric railroad in the western wheat regions, as right-angled feeders to the Northern Pacific line. Possibly all this would have been done, but the Villard panic came—and the farmers of the northwestern wheat fields are still without the service that was planned for them, although many thousands of farmers now depend upon trolley lines for getting their milk, fruit, eggs, and other produce to the distant market. Edison was a great admirer of Villard; and as the directors of the old Edison Electric Light Company refused to have anything to do with the electric railway or the contract, Edison treated the money advanced from Villard as a personal loan and repaid it out of his own pocket. Villard was worthy of such esteem. He was a great leader and pioneer and visualized the whole Pacific Coast development while all America was still looking eastward. At an early moment he believed that the mountain division of the Northern Pacific could be operated electrically, and acting on his request Edison devised a third-rail-and-shoe system such as is now familiar and set it up in his works yard at Orange. The steam railroad engineers refused to have anything to do with it as impracticable, and one

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can hardly blame them; but it is here and every year will see more of it.

Edison has never made anything out of all this or other pioneer electric railway work; but that is not a unique experience for an inventor. Had he "stayed in the game" he might have recouped some of his losses financially, but he was very busy elsewhere and the young art was already moving forward with swift and tremendous strides. His first electric locomotive is now a treasured relic at the Pratt Institute in Brooklyn, N. Y. The remainder of the little primitive system has rusted and faded away, or lies around, as shown, in innocuous oblivion, at one with the pyramids and castles and ancient cathedrals.

Perpetual Motion

(Concluded from page 452.)

Ernest Elie-Bessler Orphyrreus upon what are conceived to have been substantially the foregoing principles. It is related that Orffyreus, as he is generally called, made one machine about 1715, but broke it up because of the tax imposed upon it by the government of Hesse Cassel. A second apparatus was made and exhibited to the Landgrave. It is said that this machine, which outwardly appeared to be a drum 12 feet in diameter and 14 inches between faces mounted upon an iron axle, upon being started with a smart impulse—in either direction—would rotate faster and faster until the periphery was moving at the rate of about 16 feet per second. It was claimed, so it would seem, that the wheel having been set in motion in the chamber of the Landgrave and kept there under seal, was still going after the lapse of two months. The machine was stopped, so it is said, to prevent undue wear. However, the inventor kept his secret very close. The Landgrave, having made him a fine present, was shown the interior. But he had to promise not to tell what he had seen nor to make use of his knowledge. In fact, Orffyreus demanded a payment of about $100,000 for his secret. Prof. 's Gravesand of Leyden was employed by the Landgrave to investigate the machine, in so far as one might be able to do so without opening up the interior. In a letter to Sir Isaac Newton in connection with this matter, he describes it as made of "several cross pieces of wood framed together, the whole of which is covered over with canvas, to prevent the inside from being seen. Through the center of this wheel or drum runs an axis of about six inches diameter, terminated at both ends by iron axes of about three-quarters of an inch diameter upon which the machine turns. I have examined these axes, and am firmly persuaded that nothing from without the wheel in the least contributes to its motion. When I turned it but gently, it always stood still as soon as I took away my hand; but when I gave it any tolerable degree of velocity, I was always obliged to stop it again by force; for when I let it go, it acquired in two or three turns its greatest velocity, after which it revolved for twenty-five or twenty-six times in a minute. This motion it preserved some time ago for two months, in an apartment of the castle; the door and windows of which were locked and sealed."

It seems that no one who had the $100,000 ever agreed to pay it over upon the condition that the apparatus should be "found to be really a perpetual motion." Whether Sir Isaac Newton replied to Prof. 's Gravesand or not, I do not know.

A device probably similar to that just described is illustrated in Fig. 9. There is a rotatable wheel upon whose circumference arms are hinged at equal intervals. Weights are attached at the outer ends. Stops are so arranged that the movement of an arm on its hinge is limited to an angle one side of which is a prolongation of a radius. All the arms are arranged to swing from a radial direction in a circular direction contrary to the hands of a clock. By attending to the figure, it will readily be seen that on the right the weights *A*, *B* and *C* are advantageously situated to produce a clockwise motion, even though somewhat resisted. Because of a preponderant advantage which it might seem reasonable to suppose continually to attach to the weights on the right, we might look for perpetual motion.

What may be regarded as a variation from this device is exhibited in Fig. 10. Here the arms consist each of a number

of links hinged together. A trough *D C* is arranged to permit the weights, which are here loose balls, to roll from one side to the other. This trough is fixed in position. By these means, the weights of the upper left-hand quadrant are entirely removed or brought in close to the vertical diameter. When a weight rises to the point *D* it rolls off by way of a trough to an arm previously crumpled up but now outstretched.

The great thing overlooked in such devices is the question of velocity. A ball which falls from top to bottom will acquire, apart from friction, just so much momentum. This is due to the vertical distance passed over, and will not vary however tortuous the real path may be. The reason that it is due to the vertical distance is because that is the direction in which gravitation acts. Similar considerations apply to the upward movement. It is the vertical distance that counts because that is the direction in which gravitation has to be overcome. Of course, this is precisely the same from top to bottom as from bottom to top.

I may be permitted to call attention to a device somewhat similar to those just described. (See Fig. 11.) The figures to right and left of the vertical diameter are the same in number. As it is obvious that a number of 9's preponderates over an equal number of 6's, the wheel must, of course, turn clockwise. Study this device well; it is as good as any of the others.

The devices described so far all aimed at gaining a balance of power from the effect of gravity. Other inventors have sought to utilize the properties of a magnet for the same purpose.

The oldest of devices of this kind (Fig. 13) offered in 1570 by the Jesuit priest, Johannes Theisner, had a lodestone on a pillar, supposedly drawing iron balls up an incline. When they reached the top they were to drop into a curved tube which would let them out at the bottom of the incline through a trap door. The other three types are all based on what seems to have been the most popular notion of perpetual motion schemes, namely, on overbalancing one side of a wheel to make it rotate. Stephan's plan (Fig. 14), dating back to 1799, was to have four cylindrical magnets sliding in holes bored radially into a square wooden block which was mounted so as to rotate between two pivoted magnets of opposite polarity. All of these sliding magnets had their north poles pointing away from the center, hence they would be attached by the pivoted magnet with the south pole at its free end, but repelled by the other. Then the corners of the wooden block were supposed to tilt the magnets so as to carry the movement beyond the dead points.

Instead of using such a wooden block, the writer in his high-school days proposed (Fig. 15) a brass drum rotating close to a horseshoe magnet, with two rods running radially through the drum at right angles to each other. Each of these rods was to carry heavy knobs at its outer ends and a soft iron armature inside the drum. Then the magnet was to attract the armatures so as to draw out one knob after the other, leaving gravity to return them. Somewhat allied is the still more recent proposal of Korting and Hoepe (Fig. 12) that a magnet be used to attract one after another of a series of soft iron pieces connected at their ends by brass links to form a ring and supported by rods which can slide in and out on the spokes of a wheel. Of course none of these devices ever worked and some of our readers may be interested in figuring out why.

Award of the Nobel Prize to Madame Curie

THE news has just been published of the award to Madame Curie of the Nobel prize for chemistry. This great woman scientist thus enjoys the extraordinary distinction of having twice been honored with this prize, for in 1903 one-half the award in the section of physics went to Pierre Curie and Madame Curie jointly, the other half being bestowed upon Prof. Becquerel. The material benefits conferred with the prize amount to the sum of $40,000, a gift which is not to be despised, although perhaps the principal value to the recipient lies in the great honor which attaches to this award, the list of the Nobel prize winners comprising, as it stands to-day, a perfect galaxy of the greatest genii in the scientific world of our time.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

The World Patent

To the Editor of SCIENTIFIC AMERICAN:

Your article in the issue of September 9th, 1911, on "The World Patent" is very interesting, and should pave the way to the realization of said object. A universal patent would be a great benefit to the industrial world, which you so cleverly photograph, and you as a leading scientific journal of this country should take up this subject and follow it with the same ardor and energy with which you are following the naval, aeronautical, and other important fields. Your devotion to this subject should influence activity in other quarters, resulting in the realization of said universal patent. The obstacles to the realization of said universal patent may appear great, but they can be easily removed by the concentrated efforts of the inventive or patent world and the countries forming the International Union. To this end I take the liberty to humbly offer a few suggestions. The effectiveness of a universal patent depends very much upon the support given to the matter by all the countries of the International Union as well as by many of the other countries not yet members of the union. To further make a universal patent effective, it must be issued at one predetermined place to the subjects of all the countries favoring such patent rights union. As most of the countries would desire to have some control over their patent business, the most effective plan may be to have universal patents issued by an international patent office, and working patents issued independently by each country, as will be seen hereafter. To insure the validity of a universal patent, a system of examination and record must be instituted at one predetermined place, whereby all the patents issued heretofore or to be issued by the countries of the union could be thoroughly traced and examined when necessary. For the above purposes an international patent office should be established at a predetermined place, where all patent applications are to be filed, examined, issued, contested, or adjudicated. Said international patent office can have within its system a judiciary board for the consideration of lawsuits connected with said patents. Said international patent office constituting a centralized industrial bureau, should have in every important branch of its service *attachés* from every country a party to the union. Within a predetermined length of time, each country forming a part of the union could have filed with said international patent office complete records of all the patent transactions of said country. The international patent office should issue a universal patent, representing certification of examination, for any invention found after due searching and examination to be entitled to same. Said universal patent in turn shall command the issue of a working patent (without any further examinations or objections of any kind) in each of the countries of the union in which application therefor be made, the two patents constituting the complete patent in each respective country. To defray the working expenses of said international patent office, a predetermined fee should be paid for each patent application. Such universal patents could be issued for twenty years, and could be made renewable for an additional number of years after the payment of additional taxes. A suitable tax should be paid to the country of which the applicant is a citizen, upon the issue of a working patent, and only half of such tax should be levied by each other country in which a working patent is secured. The validity, as to priority and patent rights, of a universal patent shall be absolute in all the union countries and subject to formulated laws, rules, regulations, and decisions of the patent office, but the working of a patent in any one country shall not be allowed before securing a working patent. For efficiency and uniformity, a language to be used for the international patent office transactions should be determined upon. Universal patent cases may be judged in any country of the union in which the case arose, but the decisions rendered should be subject to ratification by the board of justices of the international patent office, for which express purpose such board should be created. The above plan could be placed in working order within five years from its adoption, without interfering with the operations of the various existing patent offices. Since the United States issues the greatest number of patents, it is entitled to be designated as the home of the International Patent Office, second in choice being Great Britain or Germany. For a central location England or France may be preferred. An alternate plan would give the International Patent Office the power to issue a universal patent valid in all countries of the union without the additional working patent. Such plan, however, would be more difficult to realize at the present time, since it would centralize in the International Patent Office all the powers and authorities of record, examination, and guarantee also absolute justice, instead of having this International Patent Office as an examining department for all the union countries and as a composite board of record-based justice, as it is essentially intended to be. H. B. T.

Philadelphia, Pa.

Music a Palliative and Restorative in Cases of Nervous Prostration

To the Editor of SCIENTIFIC AMERICAN:

The readers of the SCIENTIFIC AMERICAN would doubtless be interested in a few incidents illustrative of the effect of music on the mentally sick. The Georgia Sanitarium for the Insane has been making experiments along this line of thought. While the results thus far collated are not demonstrative nor conclusive, they are suggestive.

An instance of the palliative influence of music came under the writer's immediate observation. A patient with acute nostalgia (home sickness) on hearing a Stella grand piano music box, that was presented to the sanitarium for research work, immediately wrote home: "The nostalgia is gone. It is no longer acute home sickness with me. There is a Stella music box here that is health, happiness, heaven." A clergyman with chronic aphasia (inability to command words) on hearing the same instrument, summoning his will power in one supreme effort to speak, exclaimed, "That Stella is a star when it comes to music! I have been praying to die that I might go to Heaven, but Heaven is in that Stella music. Bless you, friends! What am I doing? I have lost my aphasia, the music of Heaven has given me my tongue again." A lawyer whose melancholia was complicated with acute nostalgia attended a series of musical entertainments that diverted his thoughts into new channels, and gave surcease to his imaginary troubles. Within thirty days he retrieved his former standing and was appointed a superior court judge.

The *rationale* or explanation of these marvelous results is apparent: The resuscitation or resurrection of the will power by means of the emotions, or the addressing the will through the media of the emotions that make their appeal through music. The language *par eminence* of the emotions is music. Good music conduces to the restoration of the nervously prostrated by diverting the mind from brooding over imaginary troubles. By a soothing influence exerted upon the nerves, it calms the perturbed brain tissue, and acts as a stimulus, vivifying partially atrophied faculties, and inspiring hope, the hope that the melancholiac may yet accomplish some great achievement.

Owing to the fact that the State has all it can do to provide the absolute necessities of life for its three thousand insane, there is no appropriation for musical instruments. We are therefore under the necessity of laying these facts before the philanthropic with an invitation to cooperate with us in further research work. The State will pay express charges on small boxes marked "Georgia State Sanitarium Library." Large boxes containing orchestrions, phonographs, player-pianos, or other automatic musical instruments should have express prepaid and be addressed to the writer at the musical department of the State sanitarium. A large cathedral organ would facilitate the work of research. We are not averse to second-hand material.

REV. JOHN E. AMOS.

Milledgeville, Ga.

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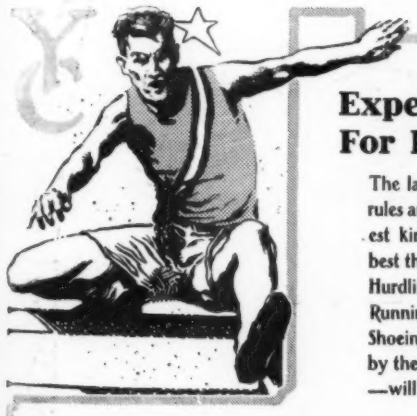

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